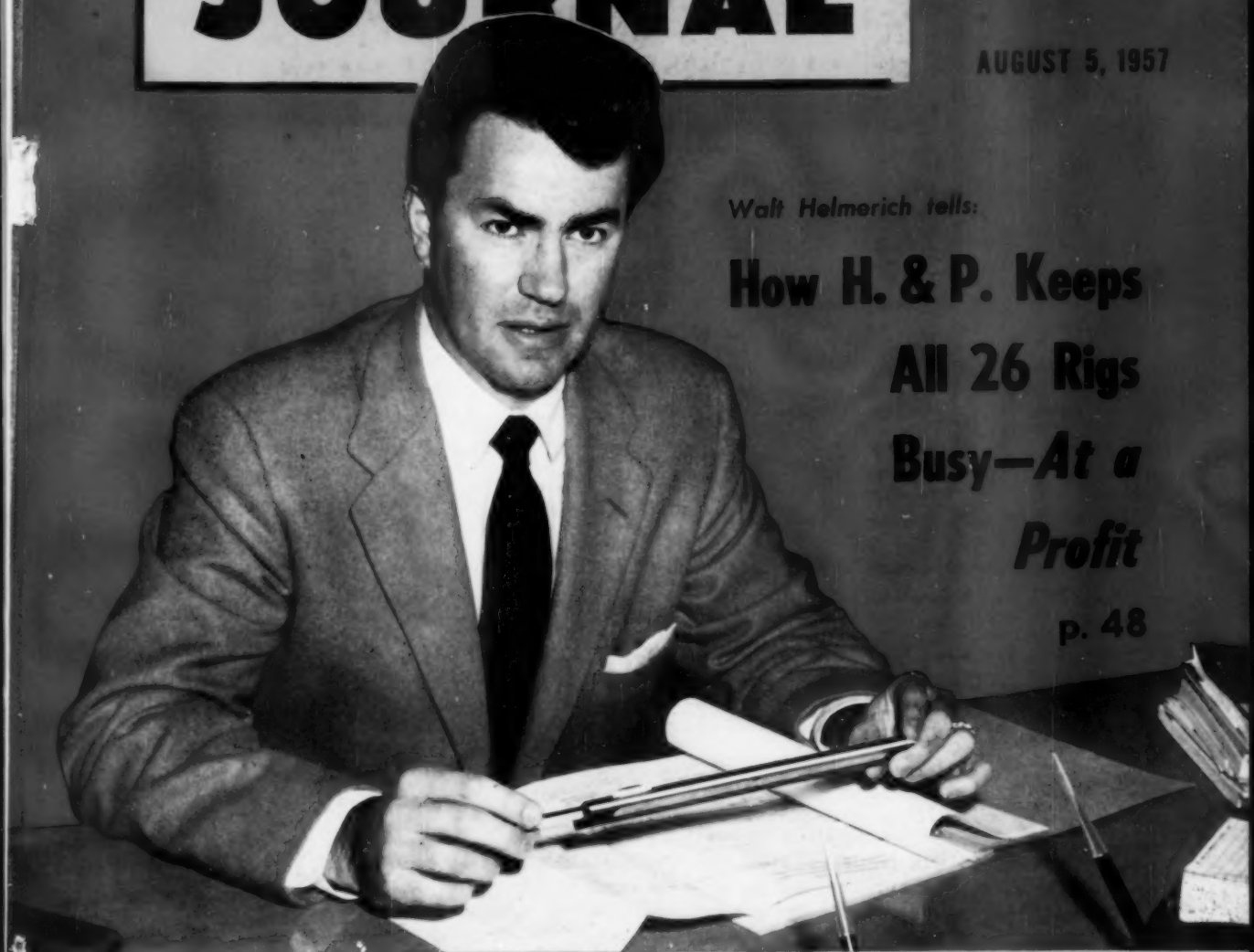
the OIL AND GAS JOURNAL

AUGUST 5, 1957



Walt Helmerich tells:

How H. & P. Keeps All 26 Rigs Busy—*At a Profit*

p. 48

IMPORTS CONTROL

. . . How soon will it help? p. 43

Carter concludes:

Crude Prices Are Below Replacement Cost p. 46

New Tool Controls Direction of Well Fractures p. 54 & 64

Timken bearings used on the crankshaft of Ideco's new 1250 h.p. Mud-Master slush pump for smoother operation, longer life.

New pump meets any mud circulation problem with TIMKEN® bearings for longer life and minimum maintenance

THIS new 1250 h.p. Mud-Master slush pump built by Ideco meets the increasingly heavy hydraulic requirements of deep oil well drilling. Because it's designed for sustained trouble-free operation under highest pressure conditions, Ideco engineers equipped its entire crankshaft assembly with Timken® tapered roller bearings.

Makers and users of rugged oil-well equipment specify Timken bearings because they provide long life with minimum maintenance. Because of their tapered construction, Timken bearings take both *radial and thrust loads,* or any combination. And full line contact between rollers and races gives them load-carrying capacity to spare. They hold the crankshaft in rigid alignment, minimize deflection and end-play that wear down related parts. And Timken bearings take shock loads, too. They're case-carburized for hard, wear-resistant surfaces over tough, shock-resistant cores.

To get all these advantages for the machinery you buy or build, specify Timken tapered roller bearings. Always look for the trademark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

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TAPERED ROLLER BEARINGS ROLL THE LOAD

JOURNAL News Letter

Aug. 5, 1957
Tulsa, Okla.

What happened to the Gray report on imports?

This is one of the interesting behind-the-scenes questions being asked in Washington following last week's presidential move to stem the flow of foreign oil.

This much can be told:

ODM Boss Gordon Gray at Eisenhower's request in the spring personally interviewed officials of importing companies. He is understood to have reported to the administration a voluntary imports plan would not work.

Late in June word leaked that a stiff, compulsory order to cut imports across the board would be issued shortly.

The order failed to materialize. Then it was learned that thinking among Cabinet committeemen suddenly had changed. They favored trying one more voluntary plan.

That was the plan finally made public last week but described 3 weeks ago by The Journal Newsletter. The Cabinet committee report recommending the plan, however, made no mention of the Gray report.

Washington newsmen now are trying to assess the role played by Gen. Ernest O. Thompson of the Texas Railroad Commission.

Did Thompson turn the tide against compulsory government control?

Thompson is a keen student of the oil industry, a dynamic personality, and has the confidence of many oil-industry leaders. He is a known foe of governmental interference in business.

The canny Texas by his own admission was in Washington 20 times in recent weeks conferring with officials on the imports question.

He was on hand the day the plan was made public. He was one of the first to praise it as a far-sighted action by the administration.

Three policy proposals rejected by the Cabinet committee are intriguing.

These called for the Government to:

...Import foreign crude and store it in depleted fields or elsewhere. The idea was rejected as too costly and impractical.

...Participate actively in exploring for oil and then keep the reserves

found out of production. This also was rejected as too costly and contrary to principles of free enterprise.

...Encourage all imports possible in order to conserve our own natural resources. Committeemen, however, decided the domestic oil industry would be crippled by such a policy with resulting harm to national security.

Major bit manufacturers have raised prices 12-1/2 per cent.

Price increases ranged from $20.63 to as much as $46.38, depending on size. This pushes up the price of bits in the 6-7/8 to 7-7/8-in. range to $185.63 each and in 12-3/8 to 13-3/4-in. sizes to high of $417.38.

Contractors say this means $35 to $45 per rig per day added costs.

Oil industry assets reached $70 billion at start of 1957.

Of this, 62 per cent is invested in U. S., 38 per cent abroad.

Chase Manhattan Bank's latest study covering 1956 (p. 51) reveals:

...Net income of 33 companies totaled $3 billion, a 12.6 per cent increase.

...$9.7 billion was spent for expansion.

...Free-world production hit record 14.8 million barrels daily.

...Refinery throughput averaged 14.7 million barrels daily.

...Consumption at same time climbed to 15.6 million barrels daily.

...Crude reserves topped 200 billion barrels, highest ever.

Economists now have their first proof for claims oil men have been making for a long time:

Price received for a barrel of crude is less than replacement costs.

A comprehensive study of the industry in Oklahoma and Kansas just completed by Carter Oil (p. 46) reveals this:

...From 1942 to 1946, costs and prices see-sawed in a narrow range but nearly in balance.

...From 1946 to 1954, prices moved ahead of costs.

...In 1955 inflation caught up. Replacement costs shot to $3.07 a barrel while price stood at $2.78.

Conditions have grown tighter since 1955. A price increase of 25 cents has been eroded by constant jumps in wages, cost of steel, other equipment and materials, and the trend to deeper drilling.

Why were profits possible? Oil being sold was discovered some years ago at much lower finding costs.

One drilling firm has found the answer to staying in business with a profit despite the current slump in drilling.

Helmerich & Payne as a result has put all of its 26 deep rigs to work. It has halted a drop in profits which nearly caused it to quit business less than 4 years ago. (p. 48).

Here's Helmerich & Payne's formula:

...Rigid cost accounting over every item of expense.

...Training program to make crews more efficient.

...New bidding form listing all costs on a job, the break-even price, and the profit expected from the actual bid made.

...Selling the program to employes and customers by giving them full information.

The approach has received support from many oil companies. It even has brought footage-price increases in some cases where proof on low drilling profits was presented.

Oil-company profit statements coming out show the industry did better during first half than in 1956.

Preliminary reports, however, indicate earnings slipped about 10 per cent in second quarter from those made in first quarter. Drop in overall demand for petroleum is the reason.

First half earnings are running about 17.3 per cent above those in 1956 first half. Sampling of early reports shows:

	First Half Net Profits		Per Share Profits	
	1957	1956	1957	1956
Richfield	$ 13,704,817	$ 14,531,575	$3.43	$3.63
Skelly	19,933,551	15,540,112	3.46	2.70
International	23,300,000	18,500,000	1.60	1.27
Standard (N. J.)	463,000,000	392,000,000	2.35	2.00
Carter	11,600,000	-	-	-
Standard (Cal)	136,328,987	122,050,274	2.16	1.93
Sun	25,187,436	25,138,552	2.34	2.48
Texas Co.	165,145,982	138,088,709	3.01	2.52
Socony Mobil	132,000,000	124,000,000	2.81	2.64
Gulf	201,755,000*	141,545,000	6.81	4.77
British Am.	12,660,000	10,072,000	-	-
Shell	75,320,849	69,440,912	2.49	2.29
Phillips	53,398,637	51,566,719	1.55	1.50
Cities Service	36,315,000	30,403,000	3.52	3.01
Continental	23,714,000	25,549,000	1.21	1.31
Ohio	22,232,652	21,275,528	1.69	1.62

*Includes capital gains--operating net $177,564,000.

Pan American has a Wyoming wildcat rated at 4,000 bbl. daily. The discovery is one of the largest ever recorded producing from the Sundance formation. It is located 45 miles northwest of Laramie in Carbon County. Nearest production is in South Big Medicine Bow field 6 miles southwest. Flow is from 34 ft. of sand at 6,485-6,519 ft.

Better control over hydraulic fracturing may be possible now.

A process called fracture initiation is being offered in West Texas by the Western Co.

It controls the place where fracture starts and direction it takes.

New perforating tool is key to the process.

The gun sets up a line of weakness by shooting parallel holes in formation. Fluid then pumped down the casing causes the fracture and expands it in direction desired. (Pgs. 54 and 64).

Aminoil and Getty are boosting production in the Neutral Zone.

Pipeline activity is the tipoff.

Aminoil has shipped four huge 1,000-hp: diesel-powered pumping units to the area. (p. 63).

Two of the units will replace existing pumps on the 34-mile, 8 and 10-in. line from Wafra field to Mina Abdulla terminal. Other two will be used as boosters. The line recently was looped for 10 miles.

Neutral Zone production at last reports was 45,800 bbl. daily but operators have a goal of 100,000 bbl. daily by 1958.

Rangely field operators have been handed an August 21 deadline to unitize the field or work under stringent conservation controls.

Colorado conservation officials issued the ultimatum. It came after a committee of operators failed to agree on acceptable unitization program.

State is concerned at loss of 20,000 to 40,000 M.c.f. daily of gas which is being flared in the field.

Cities Service has joined the rush to field test miscible-phase displacement as secondary-recovery tool.

Company has begun pilot project in Brown dolomite under its Hughey "B" lease in West Pampa part of Panhandle field in Gray County, Tex. It will inject L.P.G. and chase it with dry gas. About 100,000 bbl. of butane a month will be injected followed by 400 M.c.f. of gas a day.

Products will be moving into Chicago from the Little Inch products system next month.

Work started last week on the 231-mile, 14-in. line from Seymour, Ind., to Chicago. Three firms--W. L. Gentry, Latex, and Western Pipeline--got the contracts except for two river crossings.

The job will be completed by the time the Little Inch is converted from gas to products, allowing Gulf Coast refiners to serve the Upper Midwest and Ohio Valley.

Texas Gas Transmission is a good example of a pipeline diversifying to improve earnings.

Its producing subsidiary has doubled its drilling pace this year.

Texas Gas Exploration completed 24 wells in the first 6 months, two more than for all of 1956.

6600 ft String of X2 Rods Starts Third Year at Sunset Beach

The site: Sunset Beach, California. The well: No. 21, operated by Albercalif Petroleums Ltd. The production: 100 bpd of 28-30 gravity oil from a depth of 6600 ft, using a string of Bethlehem X2 Sucker Rods. To date, very little water has been encountered.

The tapered string—made up of 4800 ft of ¾-in. and 1800 ft of ⅞-in. X2 rods—has been in service since May, 1955. The Bethlehem Pumping Unit, a Type 228D, has a 74-in. stroke, and is operating at 15 spm.

Bethlehem X2 rods are forged from carbon-manganese steel, and are effectively normalized to provide uniform mechanical properties. They are economical for medium pumping duty, whether in non-corrosive wells or in wells which are properly inhibited.

In addition to the X2 rod, Bethlehem produces three types of alloy rods, plus a complete line of rod accessories, to enable you to obtain economical pumping under a variety of well conditions. If you would like to have detailed information about Bethlehem sucker rods and related products, all you need do is get in touch with your Bethlehem sucker rod distributor.

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TECHNOLOGY–OPERATION

Refining-Processing

Do Profits Keep Pace With Octanes? 68
By S. W. Curry

Pool-gasoline quality is expected to advance rather steadily during the next few years at about 1.2 research-octane numbers per year. The refiner who intends to keep up must therefore be continually making new or revised processing plans. The investment will be costly but the anticipated return is good. And the refiner can expect a fair profit.

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New Process Combats Hydrogen Blistering . . 87

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Electronic indicators measure sulfur dichloride level—Aluminum jacket protects steam-carrying line—Polyethylene film used for protection—Nickel alloy coatings guard against corrosion.

Refiner's Notebook 98

COST-imating 101

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Pipelining

Supercharging Old Engines Really Pays 77
By C. S. Kenworthy

Supercharging of pipeline engines is attractive from the standpoint of lower operating costs and lower investment for added horsepower. Vertical and horizontal gas engines have been supercharged with excellent performance. The larger loads may be handled without creating unsatisfactory heating conditions.

Pipeline Patrol: Construction Report 109

Drilling-Production

Fracture Initiation Can Be Controlled 64
By Bruce Gilbert, George Neill, and Roscoe Clark

Here's a new idea that may be the answer for controlling the direction of fractures in formations. It is based on parallel holes, correctly sized and spaced, shot into the formation. Results in field tests make it a promising new tool to give a high degree of control in starting and extending fractures.

How To Get the Best Drilling Rates in Shale 88
By R. A. Cunningham and W. C. Goins, Jr.

Use of oil in lime-base muds when drilling Gulf Coast shales increase drilling rate as much as 150 per cent, improves the conditions necessary for better cutting efficiency of the bit teeth, and decreases balling tendencies. Lowering mud fluid loss by adding starch results in reduction of drilling rate of about 20 per cent.

Exploration

Pure Geology Works at Natchez 72
By G. W. Gulmon, H. F. Hansen, and B. L. Simms

The discovery pattern in the Natchez area of Louisiana and Mississippi points up the fact that the use of pure geology in the search for oil will yield amazing results. The area continues to be active—new areas are inviting, and new prospects are constantly appearing in old areas.

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Chromium	.80
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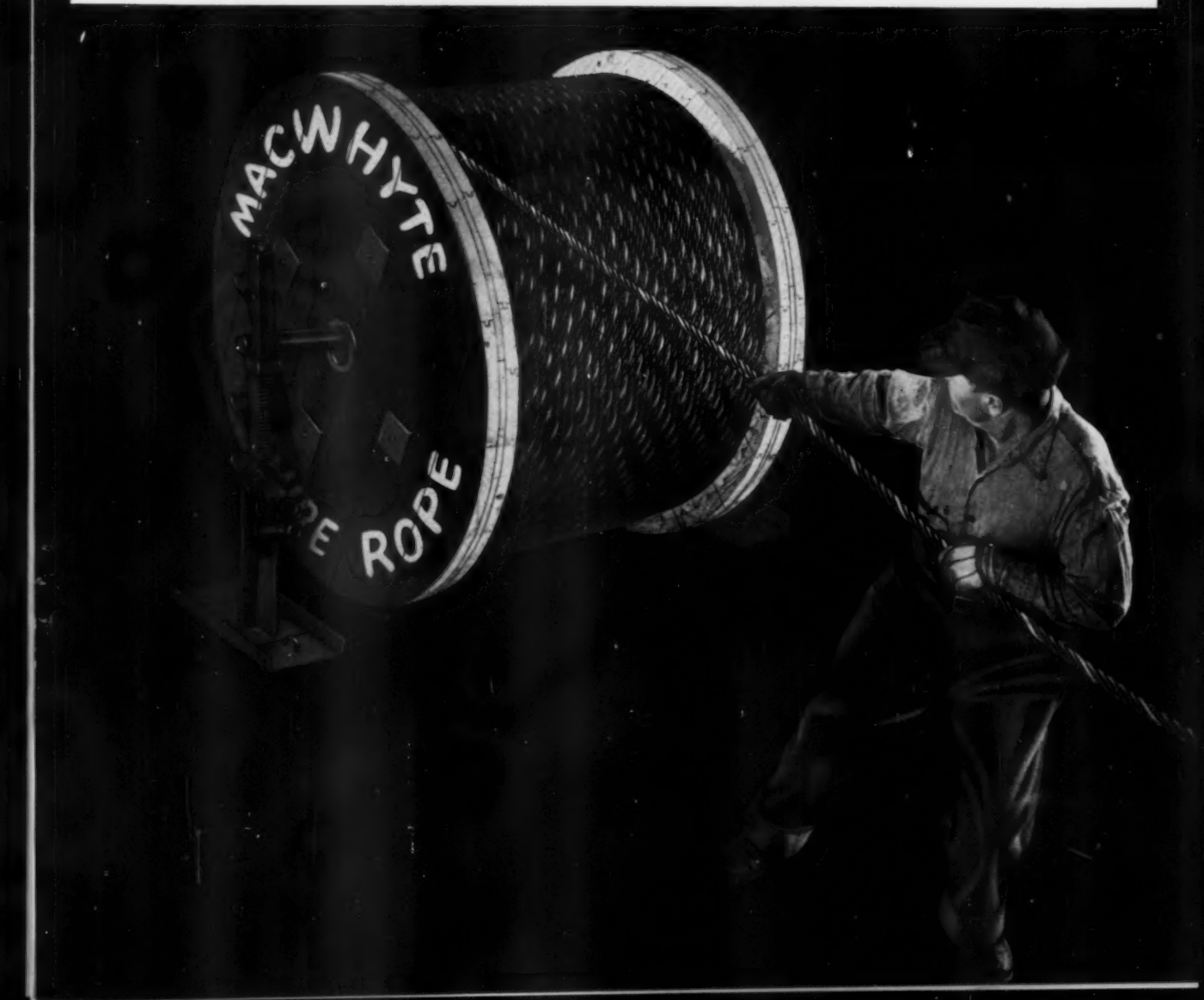

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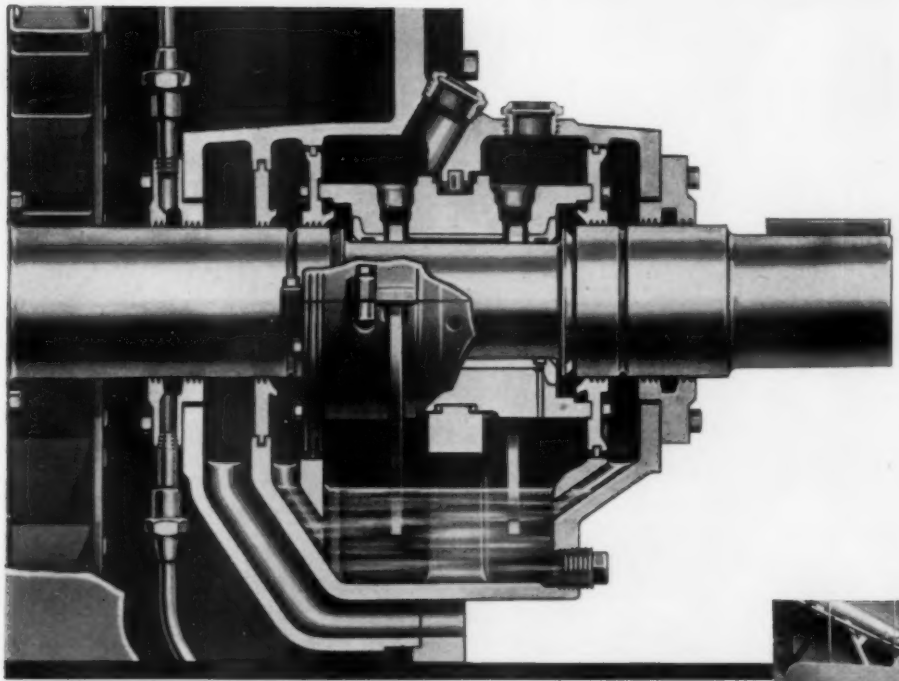

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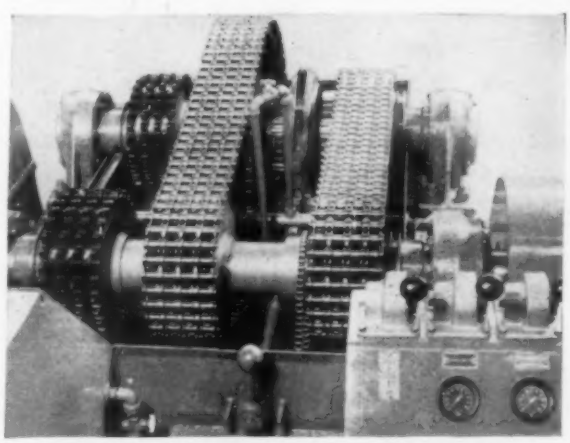

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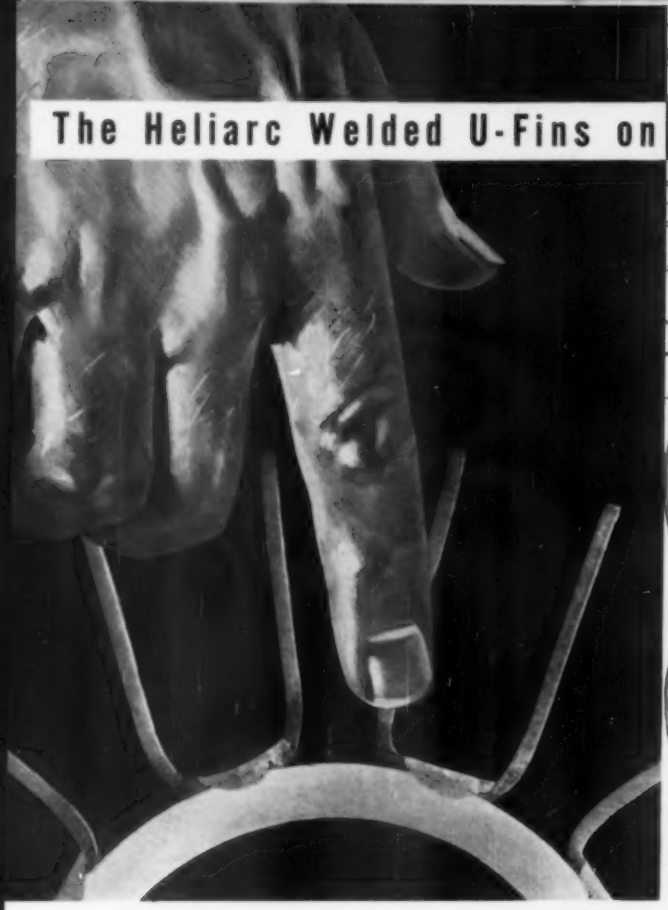

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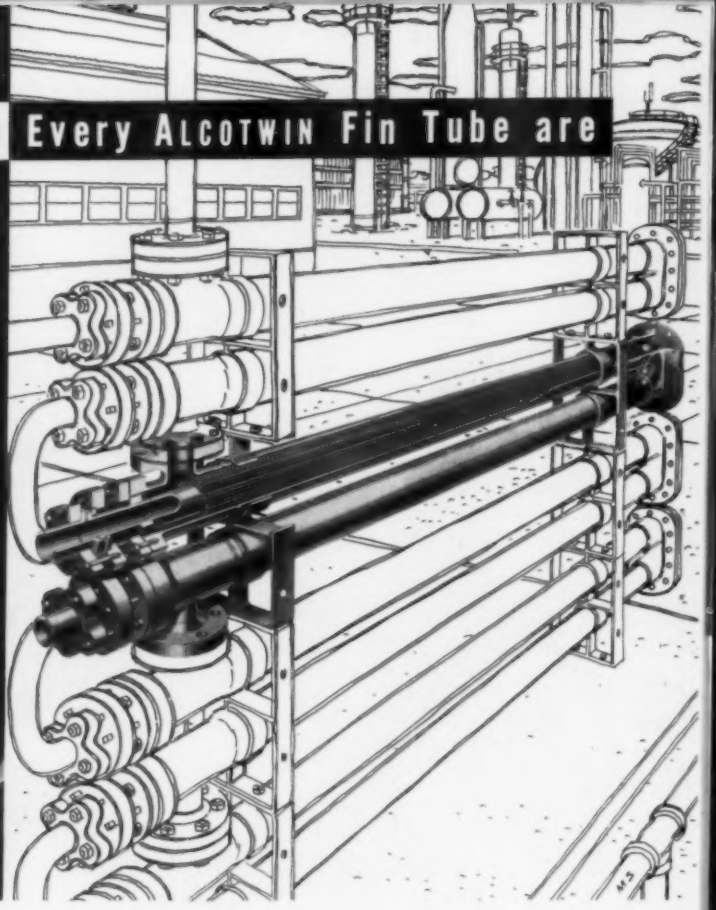

The Inside Reason for ALCOTWIN SUPERIORITY

The ALCO gas shielded tungsten arc welding method of fusing the fins to the tube leaves no discontinuities. As a result, the ALCOTWIN® heat exchanger has unequalled heat transfer efficiency. With the ALCO non-ferrous tube and fin combinations, use of intermediate high resistance bonding materials is eliminated, and design temperatures are limited only by the basic metal. This structurally strong bond assures permanent contact throughout thousands of heating and cooling cycles.

A wide range of metallurgies is available with the ALCOTWIN heat exchanger. Tubes and fins can be made of the precise materials to insure best results for your application. Combinations of carbon steel, stainless steel, low- and high-chrome alloys, non-ferrous alloys, such as Monel, Inconel, admiralty metal, cupro-nickel and copper, may be used.

There is no obsolescence with ALCOTWIN heat exchangers. They can be rearranged easily as loads and process requirements change. ALCOTWINS are in stock in Beaumont, Texas, now for immediate delivery when you need them. They are available *off the shelf* in a number of sizes, for pressures up to 600 psi and temperatures to 650° F. Pressures up to 10,000 psi and special metallurgy are available on order.

Complete information is available from any of ALCO's sales offices. For a copy of Bulletin FH-3, write Petroleum Industry Equipment Division, Dept. AW-4, P. O. Box 1065, Schenectady, New York.

ALCO

ALCO PRODUCTS, INC.

NEW YORK

Sales Offices in Principal Cities

Locomotives · Diesel Engines · Nuclear Reactors · Heat Exchangers · Springs · Steel Pipe · Forgings · Weldments · Oil-Field Equipment

GOODYEAR INDUSTRIAL PRODUCTS
G.T.M.-Specified ORTAC for hot-oil cleaning of well casings
A
B
C
A Extra-tough cover resists weather, oil, sun, abrasion
B Vertical braids of high-tensile rayon cord for exceptional strength with great flexibility
C Tube that resists oil, gasoline, solvents, air and water
ORTAC (Oil-Resistant Tube and Cover) is available in long, continuous lengths in sizes from 3/16" to 1½" i.d.

One cleaning hose: 300 wells—well done

Cleaning paraffin from well casings – with oil heated to a smoking 170°F.–quickly burned the life out of the different brands of ordinary hose this Texas rig operator tried. In fact, 5 weeks' service was the record for any of them.

Then he called in the G.T.M. – Goodyear Technical Man. The recommendation: ORTAC – the rugged hose with a tube of oil-resistant synthetic rubber. To date, this hose has put in *two solid years of service – cleaned over 300 wells* and cleaned them well. And it's still going strong.

That's one more example of time- and money-saving help from the G.T.M. It's typical, too, of service from Goodyear hose and other industrial rubber products – throughout the oil fields. To cash in, contact the G.T.M. through your Goodyear Distributor–or by writing Goodyear, Industrial Products Division, Akron 16, Ohio.

ORTAC by

GOODYEAR

THE GREATEST NAME IN RUBBER

Ortac –T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

FOXBORO d/p CELL

unequaled –

Simplest installation – orifice flange tap connections at standard spacing, are provided at both ends.

Drain and vent holes at lowest and highest points on both sides.

Purged cover protects transmitter from weather, dust, and fumes.

Over 60,000 now in use!

No zero drift . . . positive overrange protection . . . high sustained accuracy even under the most punishing operating conditions. No wonder over 60,000 Foxboro d/p Cell Transmitters have been installed since they were introduced in 1948.

By introducing the modern concept of high speed flow measurement and control, these differential pressure transmitters have *revolutionized* many an industrial process. Bulletin 13-11A shows how — and portrays the benefits the d/p Cell Transmitter offers you. Write **The Foxboro Company, 608 Neponset Ave., Foxboro, Mass., U.S.A.**

FOXBORO

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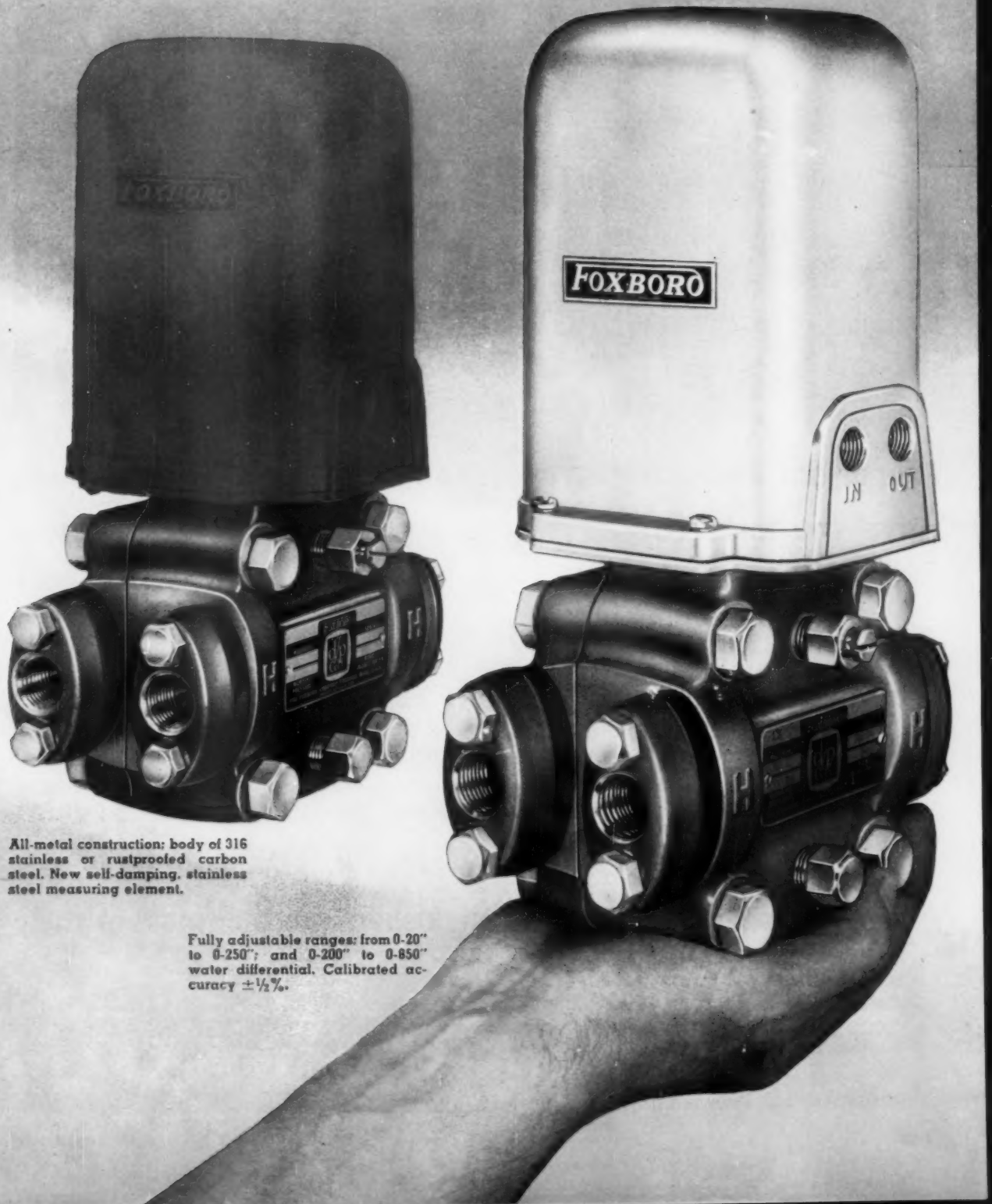
FIRST in Flow Measurement and Control

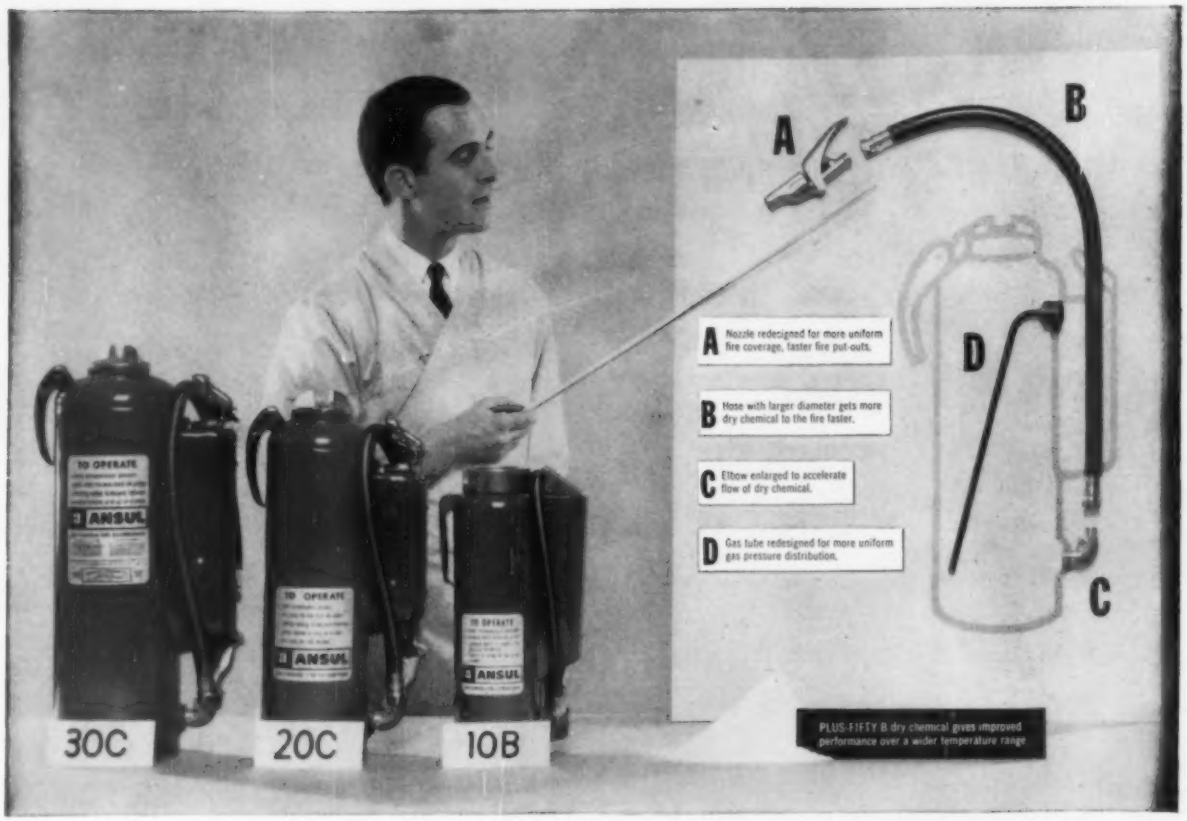
FLOW TRANSMITTERS...

in accuracy, stability and performance



All-metal construction: body of 316 stainless or rustproofed carbon steel. New self-damping, stainless steel measuring element.

Fully adjustable ranges: from 0-20" to 0-250"; and 0-200" to 0-850" water differential. Calibrated accuracy ±½%.

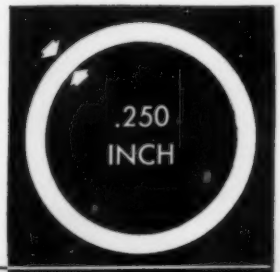

A
B
C
D
A Nozzle redesigned for more uniform fire coverage, faster fire put-outs.
B Hose with larger diameter gets more dry chemical to the fire faster.
C Elbow enlarged to accelerate flow of dry chemical.
D Gas tube redesigned for more uniform gas pressure distribution.
PLUS-FIFTY-B dry chemical gives improved performance over a wider temperature range
30C
20C
10B
ANSUL

Important design improvements in these Ansul Extinguishers give you more fire fighting power at no increase in price. Three years of research and more than 2000 fire tests turned up some significant new information on dry chemical extinguishment. Ansul engineers were able to design these findings into three new extinguisher models, the 10B, 20C and 30C. Result, greatly increased fire fighting power. All Ansul equipment is backed by a five-year warranty. This is the best way we know to say Ansul fire extinguishers are the finest of their kind made anywhere.

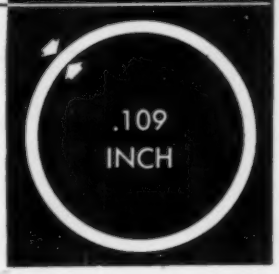
ANSUL

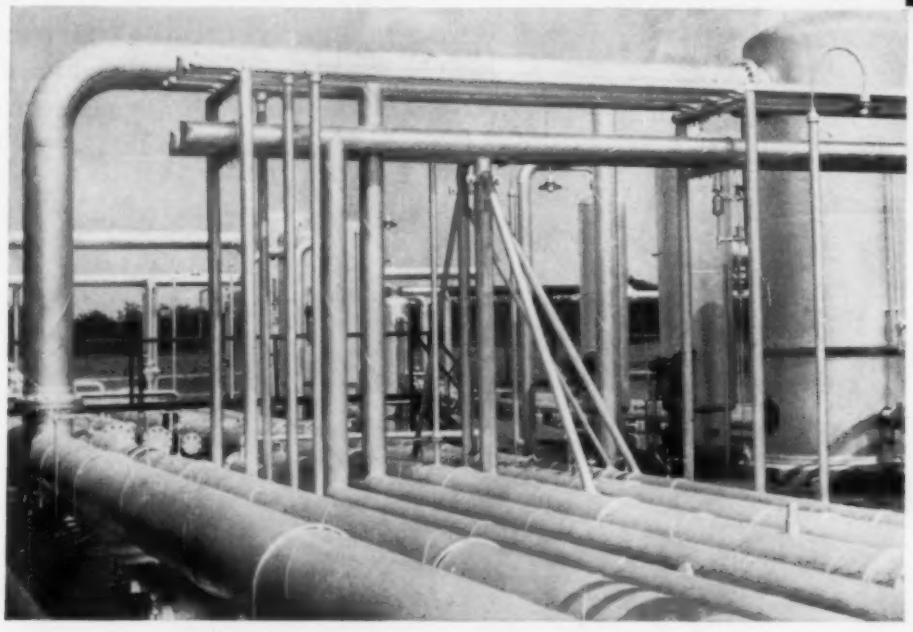
The Ansul Chemical Co., Marinette, Wisconsin

Why pay extra for this.....



When you need only this.....





Armco supplies Welded Steel Pipe to meet requirements in the Natural Gasoline and Natural Gas Divisions and wherever else you need dependable line pipe.

When your pipeline calls for light wall pipe, you can easily get what you need from the wide range of wall thicknesses available in Armco pipe.

Many lines such as gas gathering lines for natural gasoline plants, gasoline plant piping, and residue gas lines do not require expensive, heavy wall pipe. Yet the lightest wall pipe available from many suppliers is ¼-inch wall thickness.

Armco Pipe is supplied in many thicknesses from $\frac{9}{64}$- to ½-inch. You select what you need without paying for excess metal. Also, you can choose from 20 different diameters of Armco Pipe, ranging from 6 to 36 inches.

WRITE FOR DATA

Write for complete information applied to your needs. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 3647 Curtis Street, Middletown, Ohio. 201 KOME Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO WELDED STEEL PIPE

Important? Yes...but definitely no secret

EVERYONE IN PIPELINING KNOWS ABOUT GASO

Talk to anyone active in pipelining about GASO Pumps and he'll tell you they're such a familiar sight in the field that pipeliners think of them as standard equipment. It's a reputation based on performance that would be hard to believe were it not confirmed by accurate cost records. We're as close to you as our nearest distributor.

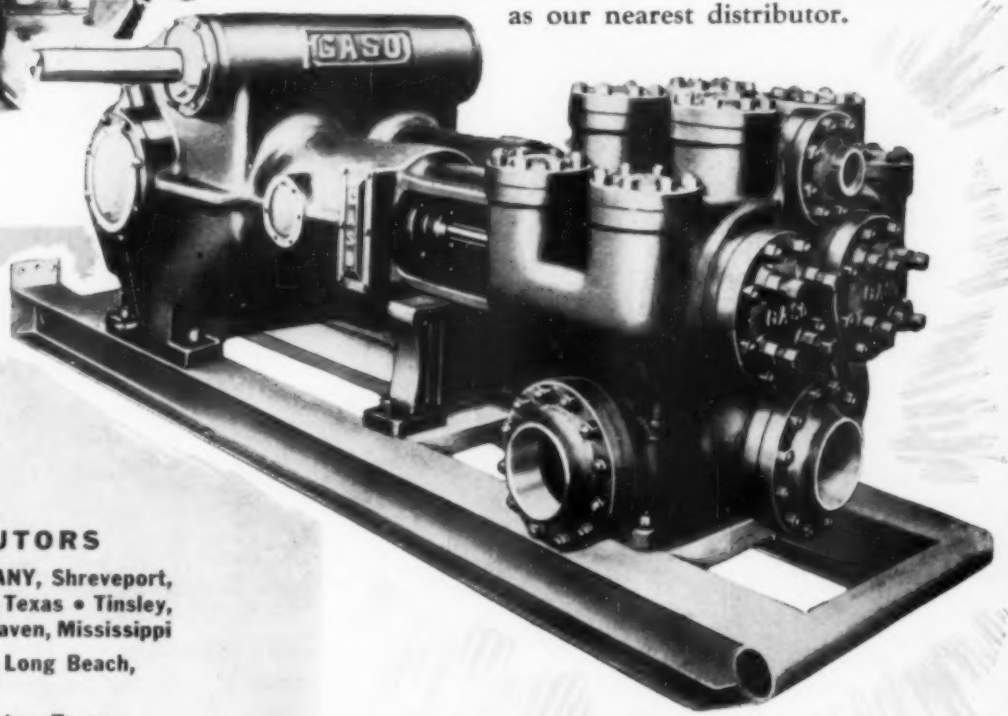


Fig. 2651-2652 — Gaso 12" stroke Duplex Piston Power Pump. Largest of Gaso models designed to pump oil or water through long lines at pressures from 475 to 1500 psi.

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GASO PUMP & BURNER MFG. CO.

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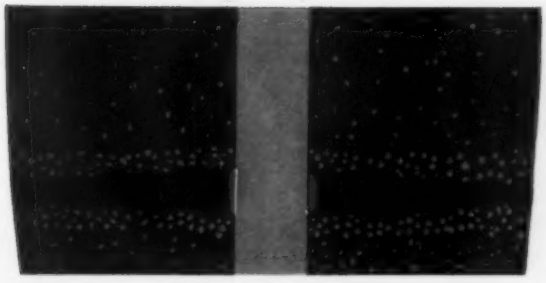
GASO PUMPS

for every oil industry need



HALLIBURTON MULTIFRAC

means more fractures for more oil

MULTIFRAC helps get more oil out of many pay zones by making multiple fractures for added drainage.

MULTIFRAC is used with any one of the 7 basic Halliburton fracturing fluids. Makes additional fractures possible in wells that have zones unsuitable for isolation with packers. Effective in open hole or perforated casing.

HERE'S HOW IT WORKS...

Pressure is applied till fracture is formed. Next a temporary plugging agent is introduced. It bridges and seals the first fracture. Pressure is continued till fracture occurs in another part of the zone. Process is repeated as many times as needed. In a thick producing interval or group of thin intervals, the many flow channels opened by Multifrac will usually produce oil faster and longer than a single fracture.

Investigate Halliburton's Multifrac Process for your well.

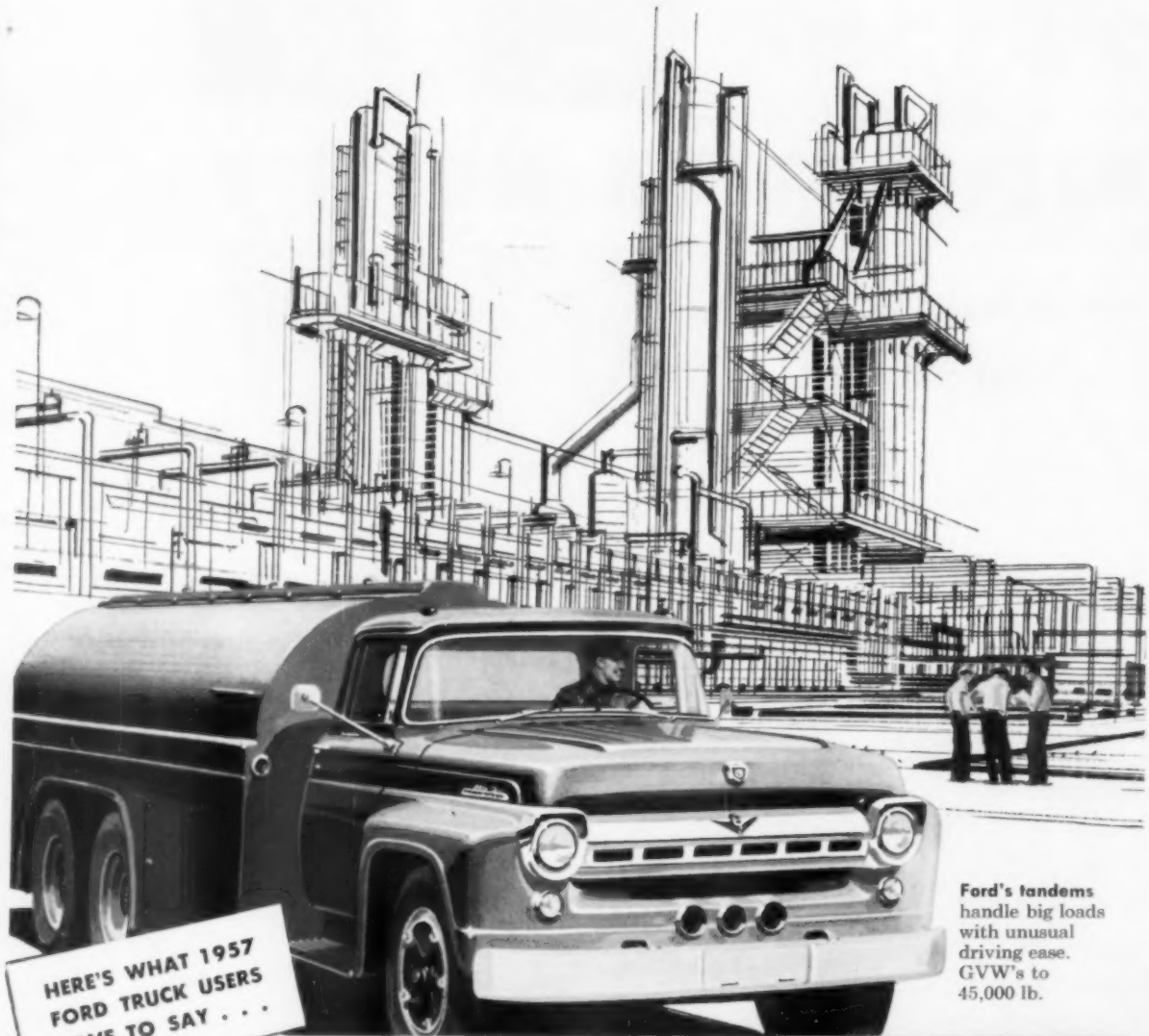
HALLIBURTON

OIL WELL CEMENTING COMPANY, DUNCAN, OKLAHOMA

PIONEERS IN FRACTURING SERVICES

251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

The Big Fleets buy



HERE'S WHAT 1957 FORD TRUCK USERS HAVE TO SAY . . .

Ford's tandems handle big loads with unusual driving ease. GVW's to 45,000 lb.

Ford F-600 tank truck owned by Farmer's Oil Service, petroleum distributors, Merced, California.

"The bulk of our business is with ranchers. Our 1957 F-600 runs all day long—using the engine to pump gas when it's not running on the road—on seven or eight gallons of gas," reports Donald J. Parsons, owner.

Ford F-600 tank truck owned by Texgas, Incorporated, petroleum distributors, Stillwater, Okla.

"We make our own roads and require special equipment like no-spin rear ends, pumps and LP-Gas carburetion. We find that Ford trucks adapt more easily and better to our needs," says Rex E. Stockard, president.

more FORD TRUCKS than any other make!

Why?... because on-the-job performance and low operating costs prove FORD trucks cost less!

Take a tip from the men who buy trucks every year. Official truck registration data for the past two years shows that owners of America's biggest commercial truck fleets have bought more Ford trucks than any other make!

Petroleum transporters, large and small, have found Ford trucks are best for their fleets. To begin with, Ford's initial costs are low. Many models are priced below all competitive makes. For example, the new Ford Tilt/Cab models are America's lowest-priced!*

And it costs less to run a Ford truck! Thanks to modern Short Stroke power and sturdy chassis construction, operating costs and "shop time" are reduced. Another important Ford plus is longer truck life—a fact certified by independent insurance experts.

Add it all up—you'll find Ford trucks do cost less! Contact your Ford Dealer... let him show you why the big fleets are buying more Fords than any other make.

Based on comparison of manufacturers' suggested retail prices

Ford's Tilt/Cab Models are big in power, in capacity . . . up to 212 hp. Six series provide GVW's from 18,000 lb. to 30,000 lb., GCW's to 60,000 lb.

Ford F-800 tractor with tank semi-trailer owned by Gasoline Transport Company, Louisville, Kentucky

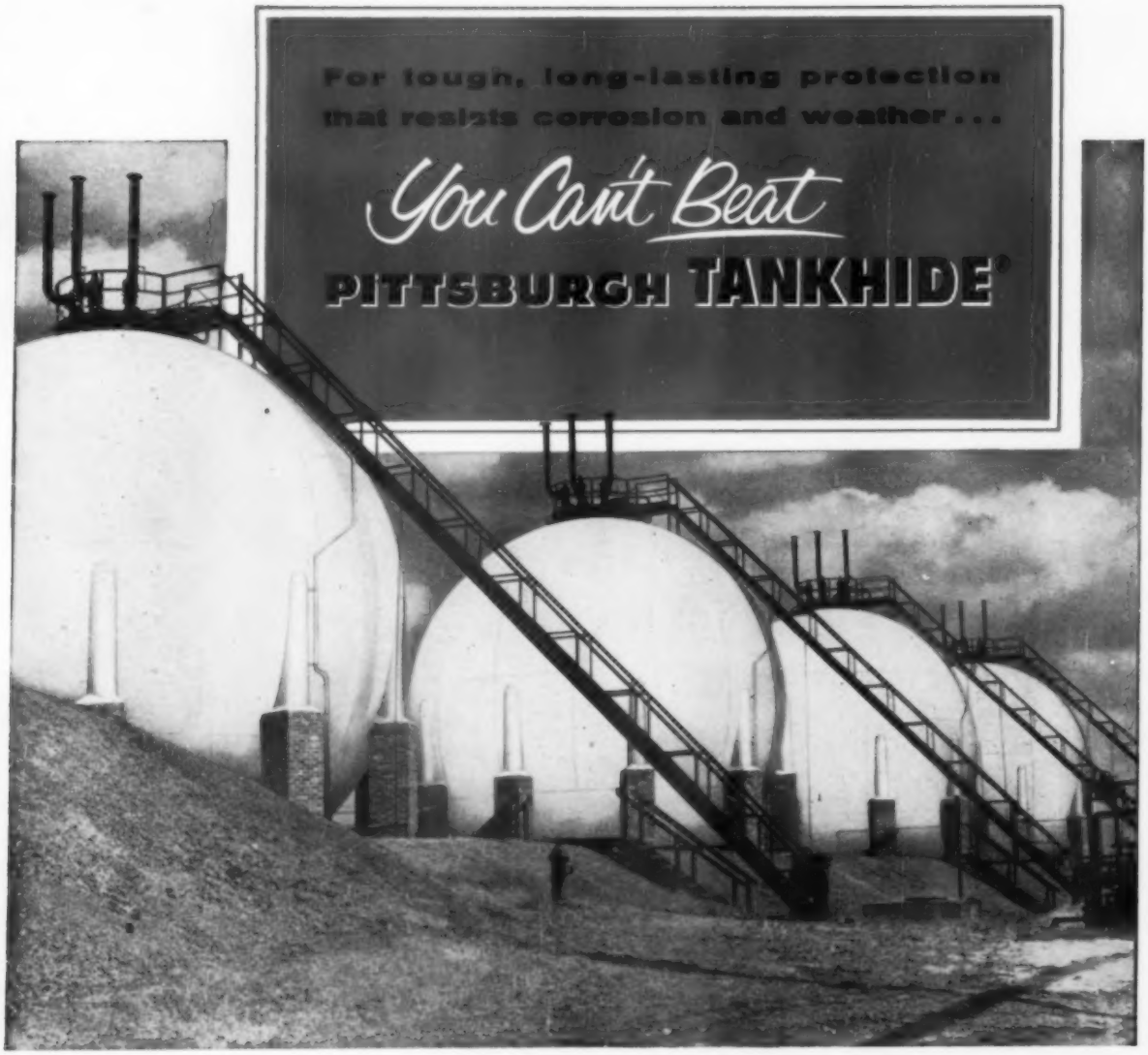
"The F-800's stamina is good and its power is excellent. Our Fords will pick up a load and get it rolling just as quickly as heavier trucks costing twice as much," says J. A. Gammon, vice-president.

FORD TRUCKS COST LESS

LESS TO OWN

LESS TO RUN

LAST LONGER, TOO!



WHEN YOU'RE LOOKING for exceptional toughness and durability in a finish for gasoline and oil storage tanks, you'll choose Pittsburgh's brilliant White TANKHIDE.

Here's a tough, long-lasting coating that saves you money in two important ways. Its special pigments and vehicles withstand corrosion and weather. Its high heat and light reflection reduce loss of tank contents caused by evaporation.

White TANKHIDE gives you one-coat hiding—can be brushed on when spraying is impractical. Its quick set and firmness of film during drying period prevent collection of dirt and insects, reduce damage from rain, scuffing and abrasion to a minimum. Self-cleaning action maintains its gleaming whiteness throughout its long life.

TANKHIDE is also available in synthetic gray and black as well as in gray and black oil-base finishes that can be used on metal or wood surfaces with equally good results.

Pittsburgh provides a wide variety of high quality finishes for every need in the petroleum industry. Our wide experience in this field often can save you valuable time and money. Write, wire or phone Pittsburgh Plate Glass Company, Industrial Paint Division, 1 Gateway Center, Pittsburgh, Pa.

PPG

PITTSBURGH PAINTS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

another
first
from
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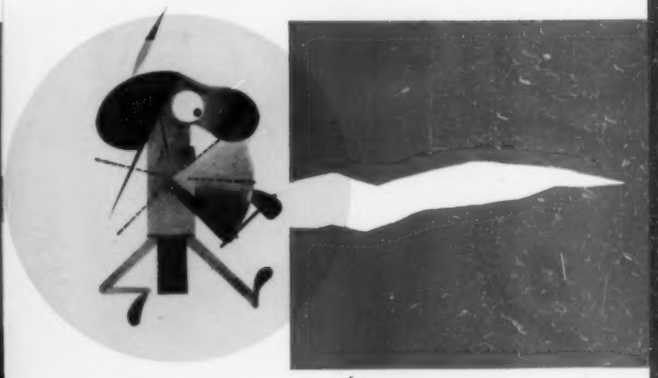
REVOLUTIONARY NEW F.I. PROCESS

now:



create
and
control
fractures
with
Western's

F.I.* PROCESS

*Fracture Initiation

for the first time... create and

Revolutionary F.I. tool, key to Fracture Initiation Process.

The F.I. Process has been developed and proved through many months of research and in more than 50 field applications in wells throughout the Southwest. Numerous case histories of well completions with the Fracture Initiation Process, technical information, and other data may be obtained by mailing the coupon below.

THE WESTERN COMPANY • BOX 310 • MIDLAND, TEXAS

Please send me more information about the new Western F.I. Process.

Name _____

Company _____

Address _____

_____

TEXAS: Andrews, Borger, Lubbock, Odessa, Rankin, Seagraves, Snyder OKLAHOMA: Healdton, Lindsay, Oklahoma City NEW MEXICO: Hobbs KANSAS: Liberal, Ulysses

control fractures

with Western's F.I.* Process:

- **Initiates horizontal fractures where you want them**
- **Creates stress pattern to continue fractures indefinitely on desired plane**
- **Fractures deep into formation at most strategic location to effect maximum drainage of formation oil**
- **Fractures can be controlled in spite of variations in formation strength**
- **Minimizes danger of fracturing into water or gas cap**

Principle of F.I. action is demonstrated by breaking block of ice. Preliminary chips with pick along line create stress pattern, and ice breaks along same plane with hard blow. F.I. tool creates stress pattern, and controlled fracturing treatment extends fracture on same plane.

Actual concrete block fractured by F.I. Four feet in diameter, the completely cured cement has 17# 5½" J-55 casing set in center. By creating a stress pattern, F.I. permitted the block to be fractured along the horizontal plane.

F.I. — Western's revolutionary Fracture Initiation Process—accomplishes what no other process or tool has been able to do—create and control fractures.

F.I. offers access to the formation through the casing, creating a stress pattern in the desired plane. The fracture is then extended in the identical plane by a controlled fracturing method perfected by Western engineering.

You get better drainage of the producing formation by placing the fracture in the most desirable position, virtually eliminating the danger of fracturing out of the pay zone or into gas caps or water.

Western CONTROLS the fracture—extending it deep into the producing formation.

Application of the Fracture Initiation Process is almost unlimited. Single fractures may be created in a thin zone, or multiple F.I. fractures in thick pay sections. More than 50 F.I. completions already accomplished attest to the effectiveness of the process.

F.I. is the ONLY proven method of creating and controlling fractures on a horizontal plane. Other attempts at fracture creation have resulted in random fractures, ineffective and uncontrollable, in the many tests conducted.

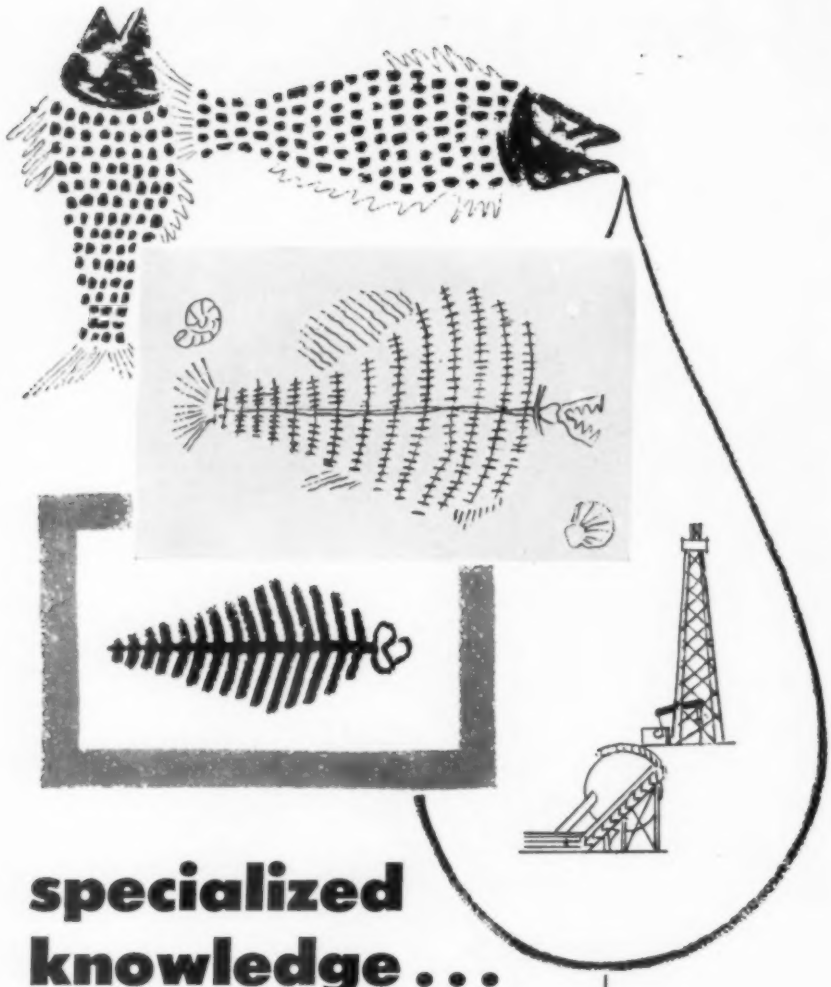
Get more information about the revolutionary F.I. fracture creation method from your Western Engineer—or request it direct from Western general offices with the coupon on the opposite page.

Get all the advantages of Western Engineering — because Western Engineering makes a difference — in radioactivity logging, jet perforating, fracturing and acidizing. GO WESTERN!

THE WESTERN COMPANY

GENERAL OFFICES: Midland, Texas

*patent applied for



specialized knowledge . . .

of the oil industry
is important to sound
financing of oil operations.
That's why you hear more and
more oil men say:

"for my money . . . it's THE FORT WORTH NATIONAL BANK"

FWNB

CAPITAL AND
RESERVE ACCOUNTS
OVER $30 MILLION

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

HELPING BUILD A GREATER
FORT WORTH AND SOUTHWEST

They Say—

O'Mahoney on two horses

Dear Sir:

Your "Journal News Letter," which appears on page 1 of The Oil and Gas Journal, April 22, 1957, carried an article about the Government's contract for sale of production in the Elk Hills Reserve during the next 5 years.

Since this paragraph brought out the point that the price to be paid was above the posted price and Washington had been so quiet about it, I decided to write Senator O'Mahoney and ask why he was not screaming to high heaven about "gouging" the public.

I am attaching a copy of Senator O'Mahoney's reply for your information. You will note that he points out that he is responsible for the consummation of this contract and that even though the price is high there have been no complaints. Naturally, he would look foolish patting himself on the back for a fat contract and at the same time screaming his "gouge" to the public.

He points out that the contract was let to the highest bidder which is a government policy. Yet he seems to think that such business in private industry is viscious. Perhaps this odd type of thinking should be aired to the industry. Enclosed is a copy of the Senator's letter.

Miss Suzanne Thurmon
Longview, Tex.

Dear Miss Thurmon:

With reference to the comments contained in your letter on the recent contract award for the production of Elk Hills crude oil, you may not know that it was largely through my efforts that the independents were successful in obtaining these contracts.

I agree that the price to be paid by the independents is high; however, there have been no complaints on this point, and you must remember that it is the policy of the United States Government, when conducting sales on a bid basis, to award the contract to the highest bidder.

Sen. Joseph C. O'Mahoney.

Oil in the gravel pit?

Dear Sir:

In the article, "A Prophecy Is Fulfilled," in the April 15 Journal, page 177, you told an interesting tale behind a discovery by the old Prairie Oil Co.

My story is about the same way. Exactly 28 years ago, in 1929, we hit oil in a gravel pit in northern Michigan. We have 120 acres with a 40-acre lake and a gravel pit on it, and the lake controls the water level in the area because the ground is on a high promontory.

The county was using gravel from the pit to gravel the county roads, and they hit oil about 30 ft. down, which gave them oil graveled roads for about 10 miles!

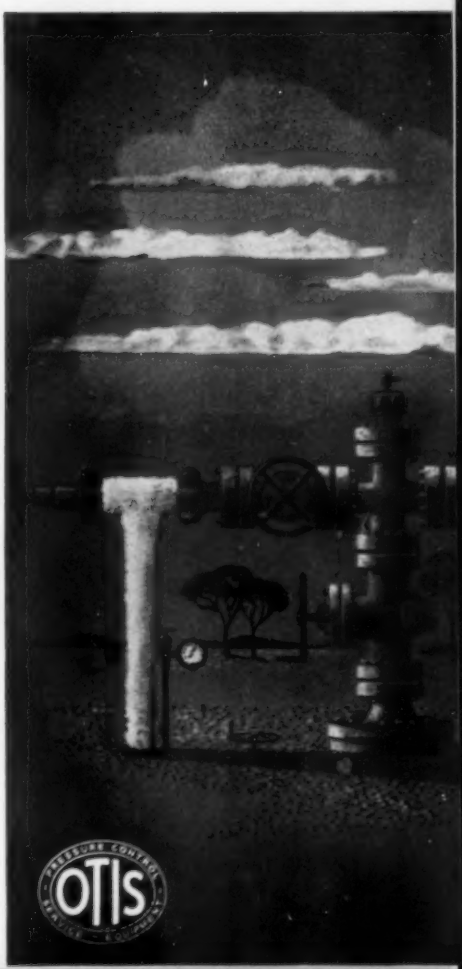
My father-in-law took a sample to the Michigan School of Mines and it tested crude oil. He contaced some oil company and they decided to put $10,000 into exploration. However, before they got started the 1929 crash came. They wrote that all exploration activities were cancelled for the time being. So, nobody has done anything about it since.

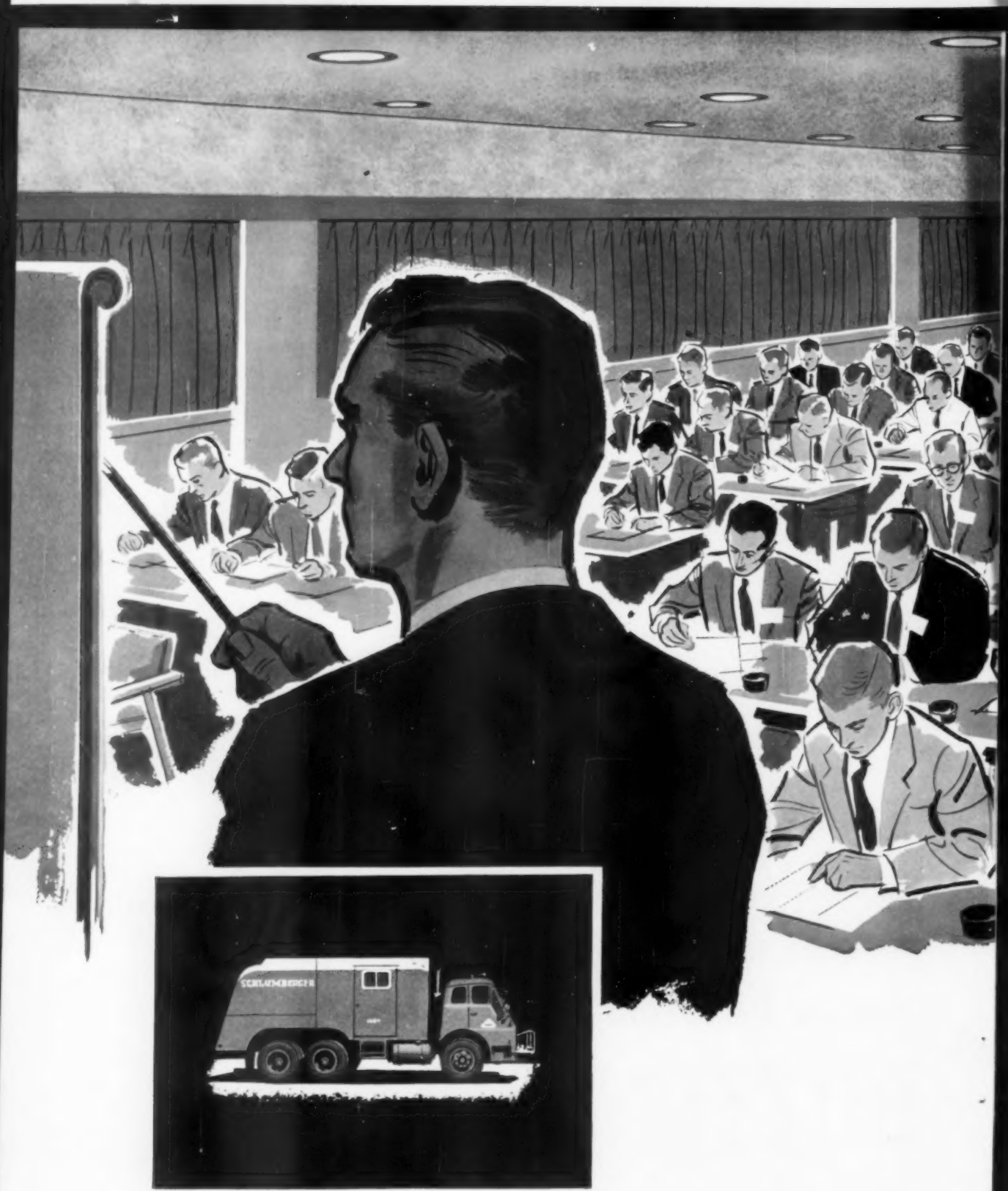
Pat Crotty
La Mesa, Calif.

Wage inflation marches on

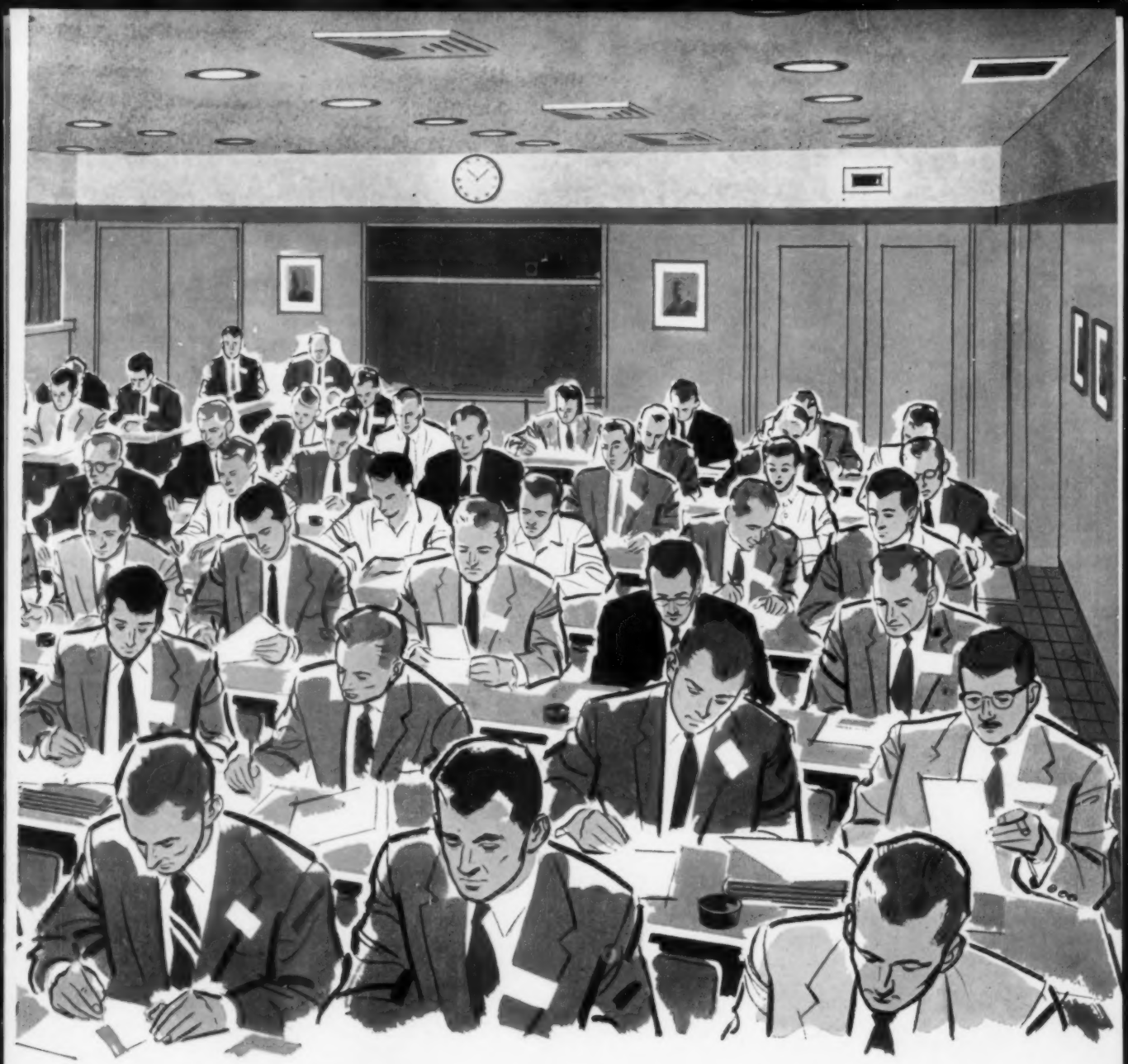
"From the last prewar year to the second postwar year, hourly earnings in manufacturing increased 87 per cent

Warm Up Flow Line Freeze Ups...
Eliminate Surface Heaters...Reduce
Pressures to Safe,
Workable Limits With OTIS
BOTTOM-HOLE
REGULATORS
OTIS / Branches Throughout the Oil Country





"The more extensive a man's knowledge of what has been done, the greater will be his power of knowing what to do."—Disraeli



We Want To Tell You All We Know About Log Interpretation

Each year Schlumberger logging conferences are held throughout the country — conferences that were established by Schlumberger, as a service to the oil industry.

The experience of more than a million operations and the knowledge gained by thirty years of continuous research, are given freely to the men attending these conferences. Logical and understandable methods of analysis and interpretation are used to strip away the mysteries surrounding logging and its modern complementary services.

More than 9,000 oil men — engineers, geologists, geophysicists, owners and operators have attended these conferences — a chair is waiting for you!

Contact your local Schlumberger office for further information.

SCHLUMBERGER . . . Engineering for Better Service

DRAFTING TRENDS

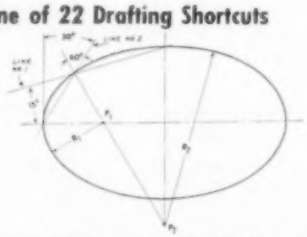
This free booklet, newly developed by the Frederick Post Company through the co-operation of leading engineers and draftsmen, shows 59 shortcuts to speed drafting and computation work.

Ideas for increasing drafting and engineering efficiency

POST went to leading engineers and draftsmen and asked them what techniques they use to save time without sacrificing precision in their work. From the many interesting tips and drafting shortcuts suggested, a total of 59 have been compiled into one handy booklet called "Time Saving Tips for the Draftsman and Engineer."

Clearly written and well illustrated, this booklet shows new approaches to old problems. The section on CALCULATING IDEAS contains 10 tips including easy ways of "Remembering the Signs of Trig Functions," "Dividing a Circle Into Parts," and "Locating Decimal Points."

One of 22 Drafting Shortcuts



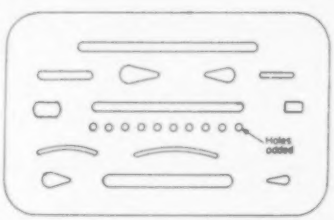
Here is what seems to be the fastest and easiest method of constructing an approximate ellipse: (1) Draw a line at 15° to major axis as shown. (2) Draw a line at 30° to minor axis as shown. (3) Draw a line at 60° to line #2 through intersection of lines #1 and #2. (4) Draw Arc R_1 from point P_1. (5) Draw Arc R_2 from point P_2.

9 tips in Engineering Data Section

Easy-to-use, practical shortcuts to formulas and other engineering data are featured in this section. Two of these time savers are faster methods of "Determining Gear Inertia" and "Interpolating Between Family of Curves."

One of 18 Board Timesavers

Fairly often when drafting it becomes necessary to change a solid line to a dotted line. By placing a series of holes in an erasing shield, as shown, it is possible to make the conversion simply by erasing through the holes.



For your free copy of "Time Saving Tips for the Draftsman and Engineer," contact your POST *dealer or write today to the Reader Service Division of Frederick Post Company, 3644 N. Avondale Avenue, Chicago 18.*

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ENGINEERING EQUIPMENT & DRAFTING SUPPLIES • FIELD EQUIPMENT & DRAFTING FURNITURE

—a little less than was experienced in the World War I period. But from then on the experience has been vastly different. Each year since 1947 the wage inflation has continued so that hourly earnings are now two-thirds greater than 10 years ago . . .

"The wage inflation is surprisingly universal and uniform. It is no minor phenomenom confined to just a few segments of the economic fabric . . . All of 22 different hourly wage series compiled by the Bureau of Labor Statistics rose markedly from 1940 to 1956—about 200 per cent of the average . . .

"This rise in all these wage series explains why costs other than employment costs tend to parallel the inflation in employment costs. The goods and services purchased from others—the capital equipment purchased—the taxes paid—all have embodied in them the paralleling wage inflations. Wage costs in consolidated industries represent three-quarters or more of all costs."

Robert C. Tyson, chairman of finance committee, United States Steel Corp., in a speech at the annual National Industrial Conference Board dinner.

Gas lags behind on cost load

"The amount of new reserves blocked out is closely related to the intensity of the industry's effort, particularly drilling, which in turn rises or falls with the gross revenue from production.

"In the period 1947-55, inclusive, and on a B.t.u. basis, 40 per cent of total additions to reserves was natural gas.

"In 1955 natural gas accounted for 39 per cent of the B.t.u.'s produced but brought in only 12 per cent of the total value of production at the wellhead, including gasoline plant products.

"Moreover, in 1955, gas B.t.u.'s sold at the wellhead on the average for a little less than 25 per cent of the value of crude B.t.u.'s. Since crude prices are arrived at through the interplay of competitive forces, they can be assumed to be fair and equitable.

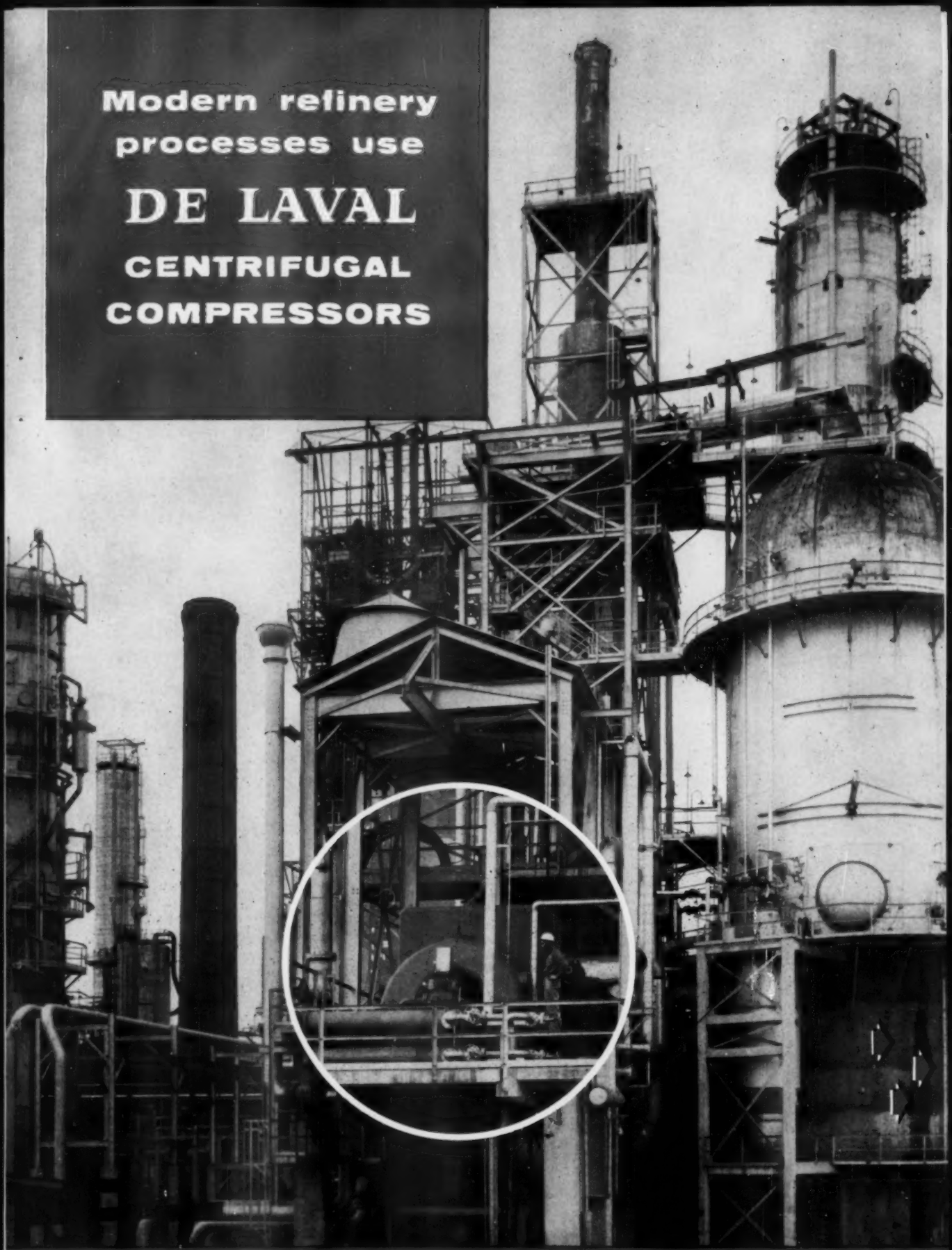
"The anomaly then is in gas prices. Such an anomalous price relationship must be corrected in time so that natural gas sells at the wellhead for what it is worth competitively.

"Today natural gas is not carrying its share of the finding and developing cost load. In time, and sooner than later, the revenue at the wellhead will be insufficient to carry the expanding, finding, and producing effort unless the price of natural gas is allowed to reach

Modern refinery processes use

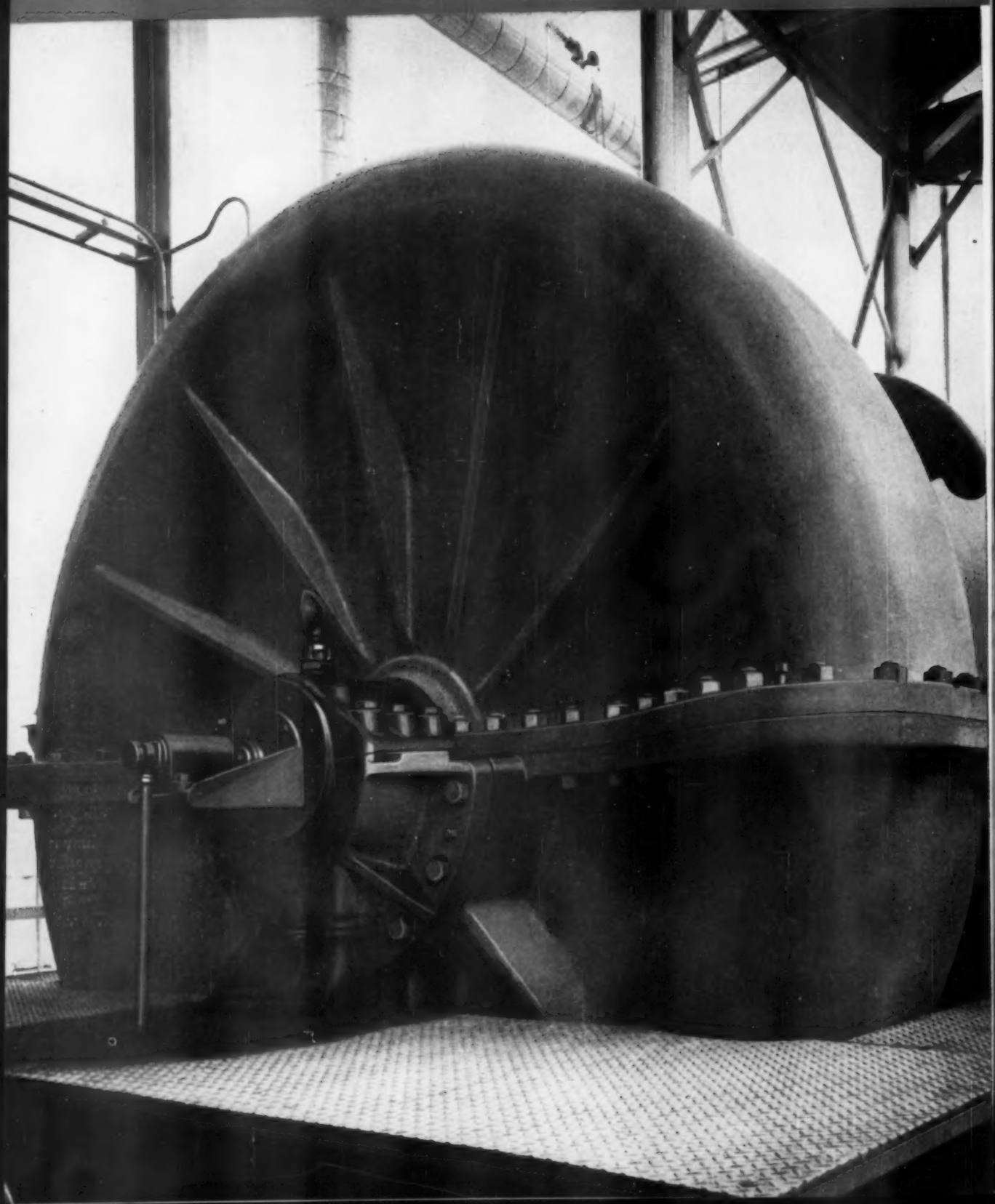
DE LAVAL

CENTRIFUGAL COMPRESSORS

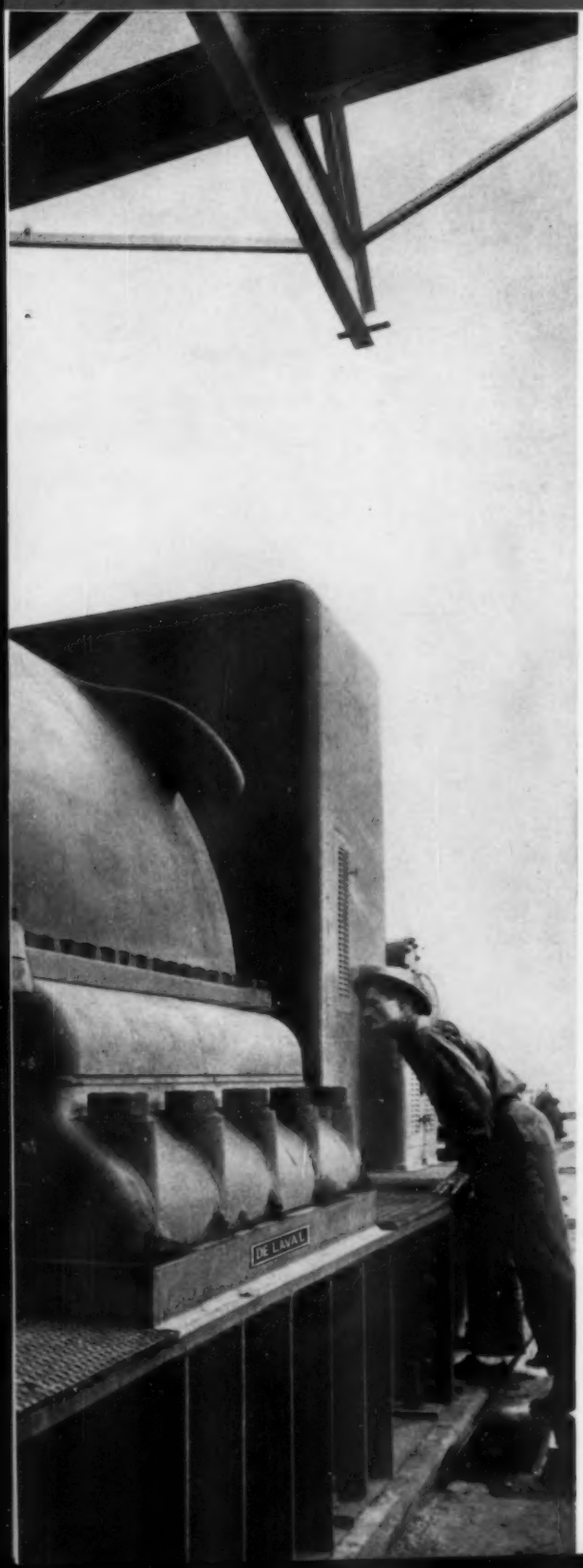


DE LAVAL STEAM TURBINE COMPANY • TRENTON 2, NEW JERSEY

DE LAVAL Centrifugal Compressor handles 83,000 cfm of air at



Ashland Oil & Refining Company



This De Laval turbine-driven main air blower handles 83,000 cfm at 47.4 psia in the UOP Fluid Catalytic Cracking Unit at the Ashland Oil & Refining Company plant in Ashland, Kentucky. Built by Procon, Incorporated, the cat cracking unit processes 22,000 barrels per day.

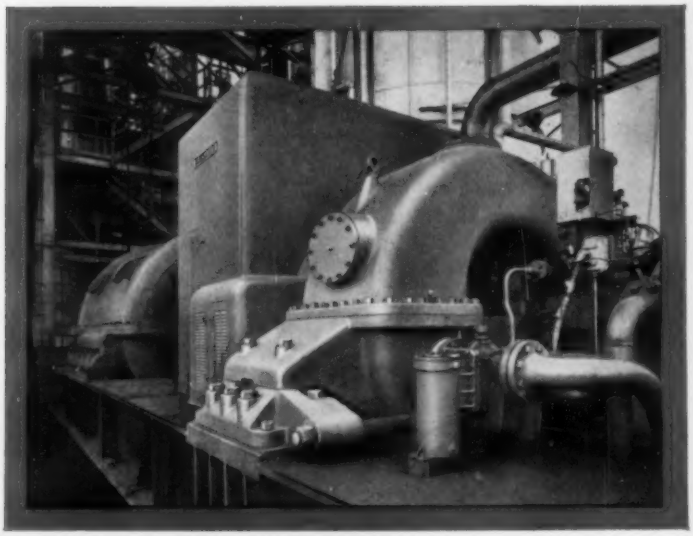
The compressor is driven by a 10,200 hp De Laval extraction turbine designed for 440 psi, operating at 700F with 1½" hg. vacuum. It extracts 150,000 pounds per hour at 155 psig.

As proof of the dependability of De Laval design and manufacture, another De Laval turbine-driven main air blower, which will deliver 110,000 cfm, is on order for a new UOP Fluid Catalytic Cracking Unit. The processing unit is currently being constructed for a leading Midwest refinery.

Available for every refinery process

Whether you need to handle light or heavy gases at high or low pressures in catalytic cracking, reforming, alkylation, coking or any similar service, it pays to look to De Laval. Rugged De Laval centrifugal compressors perform dependably in heavy-duty continuous operation. De Laval has more than 40 years of experience in solving gas compression problems.

Send for De Laval Bulletin 0504.



DE LAVAL

Centrifugal Compressors

DE LAVAL STEAM TURBINE COMPANY

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DL 389

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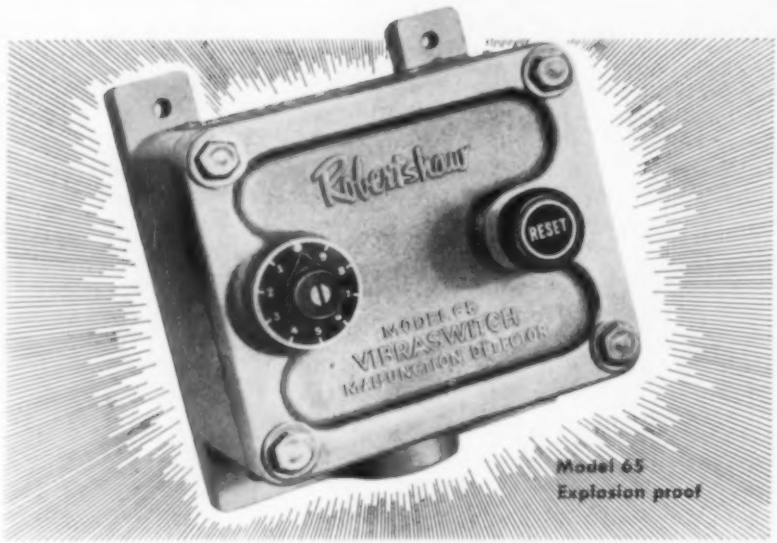
before it can start!



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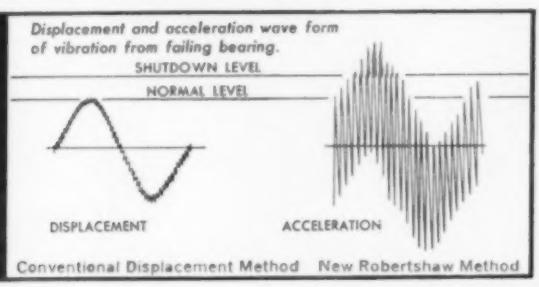

ANTICIPATES trouble such as bearing failure, imbalance, broken blades, bent shafts or any malfunction causing vibration or roughness to increase. *ACTUATES* alarm or shutdown when acceleration exceeds normal level. *SENSES* all types of shock and vibration. *RESPONDS* only to harmful vibrations—can ignore start-ups and temporary disturbances normal to operation. *OFFERS* resistance to rain, dust, oil and explosions in a variety of housings.

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its competitive level along with other prices.

"Let us never forget that the problem of finding crude oil and the problem of finding natural gas are inseparably intertwined so that damage to the exploratory effort decreases the supply of crude oil as well as natural gas."

Ira C. Cram, senior vice president, Continental Oil Co., in a speech to the general management section of American Gas Association.

Gas profit margin may slip

"Continued growth (of the gas industry) is almost a certainty, but maintenance of profit ratios is not.

"Further growth is likely to be a costly process . . . In the future, we can anticipate that an increasing proportion of our net income must result from improved internal efficiency . . . This points to the need for a critical examination of our methods of management and organization."

Louis A. Allen, partner in Booz, Allen & Hamilton, Chicago management consultants, in a speech to American Gas Association's general management section conference.

Money pours into Paradox

"Four Corners represents one of the largest enterprises ever attempted by the oil industry . . .

"The average cost of a Paradox basin Pennsylvanian dry hole is $95,000; the deeper Devonian tests cost around $105,000 each. One hundred sixty-eight wildcat holes have been drilled in the basin, representing a present-day cost of around $17,000,000.

"Of the 168 wildcats drilled, only 24 were successful and only 17 fields have been discovered. It is conservative to estimate that the oil industry has already invested over $60,000,000 in the Paradox basin."

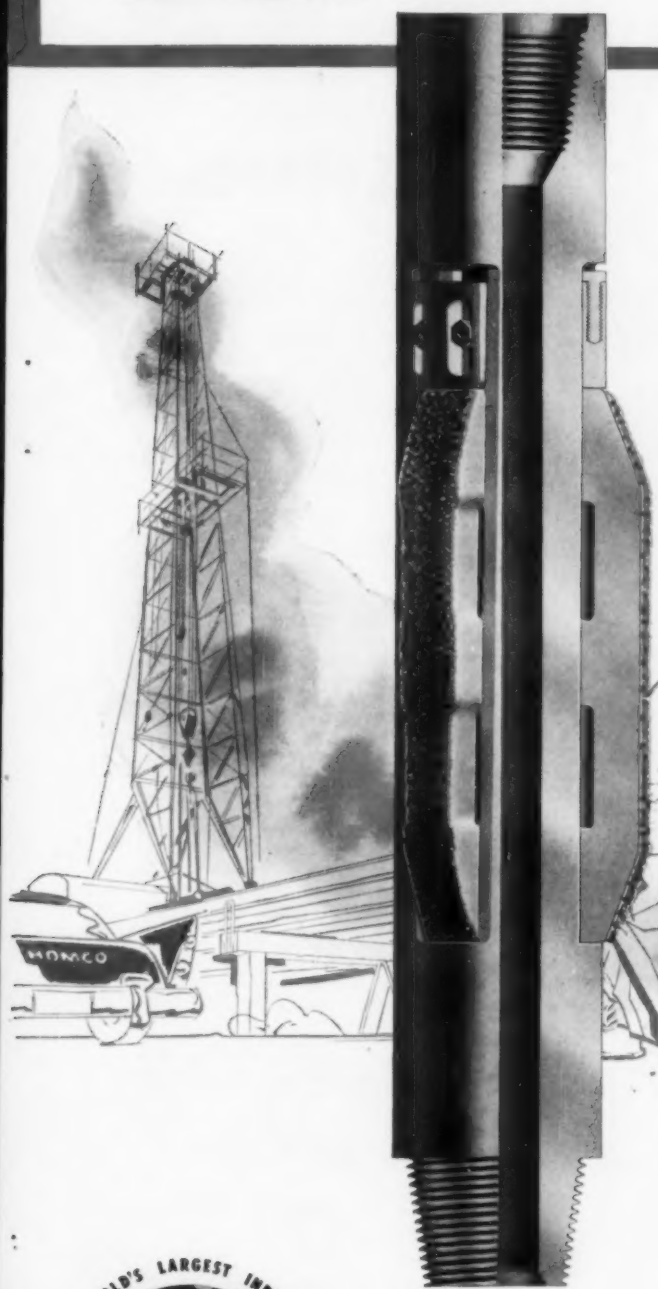
R. R. Robison, Shell Oil Co., in a speech before the Western States Gas Tax Officials convention

Unity sounds like collusion

"It is to the distinct advantage of independent producers and major companies alike to maintain before the public the separate identity which is their truest and most rightful claim to a place in the free enterprise economy of the United States.

"The continual cry for industry 'unity,' therefore, can be dangerous. Appeals for unity are more often than not appeals for the compromise of opposing or competitive interests, and this not only can be bad in itself, but

HOMCO HAS IT!



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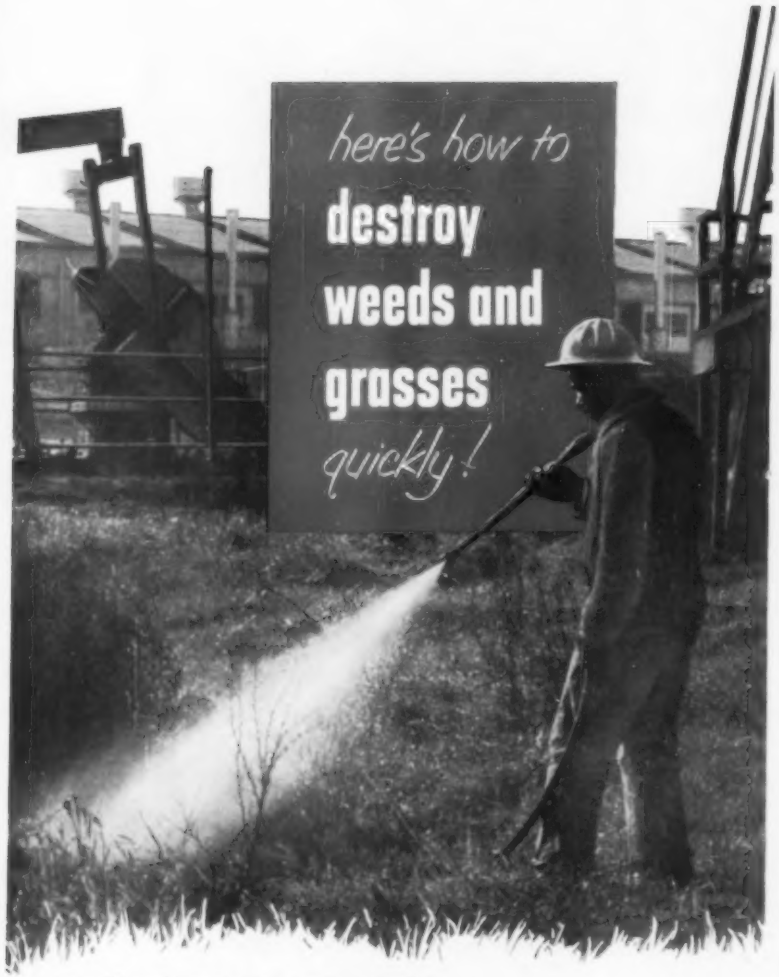

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at times it takes on the suspicious color of collusion."

From the TIPRO Reporter, magazine of Texas Independent Producers and Royalty Owners Association.

CALENDAR

AUGUST

19-20 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.
26-28 Seventeenth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.
28-30 Instrument Society of America, International Symposium on gas chromatography, Kellogg Center, Michigan State University, East Lansing, Mich.

SEPTEMBER

3-5 Pacific Coast Gas Association convention, Fairmont and Mark Hopkins Hotels, San Francisco.
5-7 New Mexico Geological Society, eighth annual field conference, southwestern Colorado.
8-13 American Chemical Society, 132nd national meeting, New York City.
9-10 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.
9-11 American Institute of Electrical Engineers, conference of the petroleum industry committee, Sheraton Hotel, Philadelphia.
11-13 National Petroleum Association, fifty-fifth annual meeting, Traymore Hotel, Atlantic City, N. J.
19-21 Rocky Mountain Oil Show, fairgrounds, Casper, Wyo.
22-25 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Mayo Hotel, Tulsa.
23-25 American Society of Mechanical Engineers, fall meeting, Statler Hotel, Hartford, Conn.
25 Natural Gasoline Association of America, regional meeting, Northern Hotel, Billings, Mont.
26-27 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.
26-27 Mid-Continent Oil and Gas Association, Louisiana - Arkansas division, Roosevelt Hotel, New Orleans.
30-Oct. 2 American Oil Chemists' Society, 1957 fall meeting, Netherland Plaza Hotel, Cincinnati.

OCTOBER

1-2 Texas Mid-Continent Oil and Gas Association, thirty-eighth annual meeting, Texas Hotel, Fort Worth.
1-4 National Association of Corrosion Engineers, north-central region, Sherman Hotel, Chicago.
1-4 National Association of Corrosion Engineers, south-central region, municipal auditorium, Oklahoma City.
2-4 Golden Trend Oil Show, Pauls Valley, Okla.
6-9 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, fall meeting, Adolphus, Baker, and Statler Hilton Hotels, Dallas.
7-9 National Electronics Conference, thirteenth annual meeting, Hotel Sherman, Chicago.

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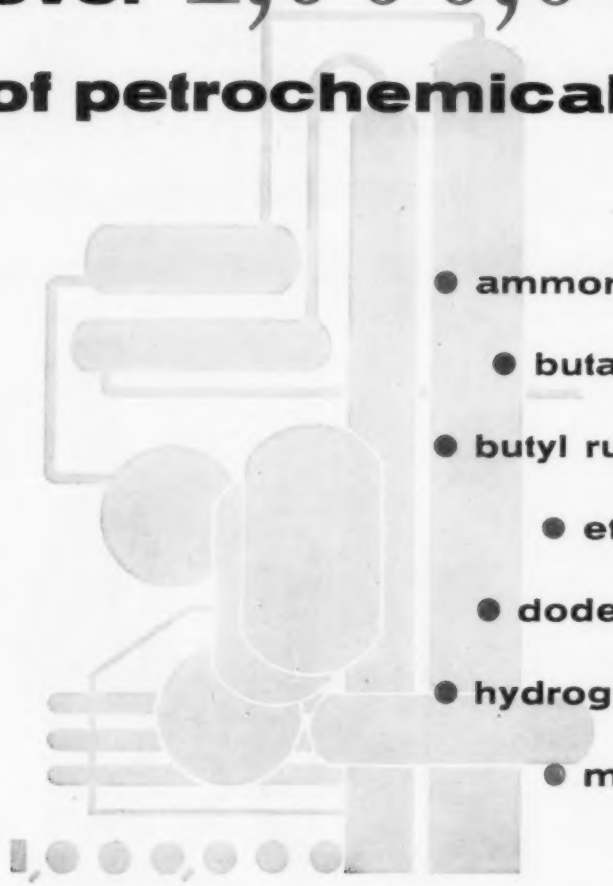

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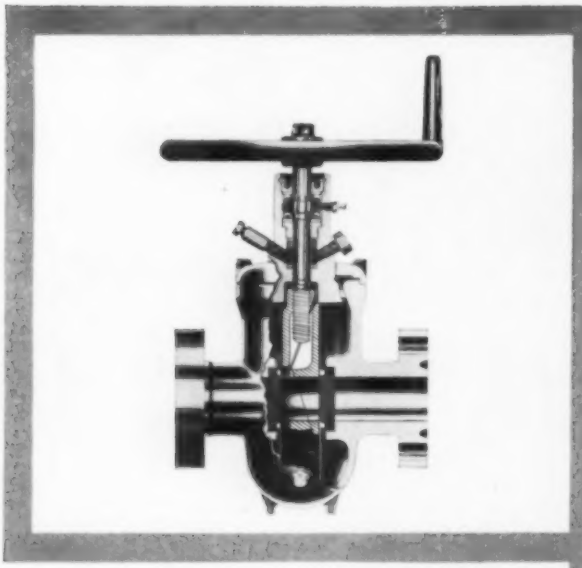

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W-K-M's Exclusive DOUBLE-TIGHT SEAL literally doubles the sealing efficiency of W-K-M® Valves. A specially designed Teflon† seat insert is the secret of the DOUBLE-TIGHT SEAL. The first seal occurs when the expanding gate and segment faces contact the Teflon insert. The second seal is made by intimate contact of gate and segment faces and metal seat. Together, the Teflon and metal seal ring provide the DOUBLE-TIGHT SEAL which holds the heaviest viscous fluids—the lightest gases at pressures up to 5000 psi. The DOUBLE-TIGHT SEAL is applied both upstream and downstream.

The self-lubricating Teflon insert provides a smooth, slick surface for the gate and segment to glide across. It compresses when the gate and segment expand in the open or closed position. The Teflon insert will not flow—it is immune to acids, alkalis and all petroleum fractions. It will not vulcanize—and never requires lubrication.

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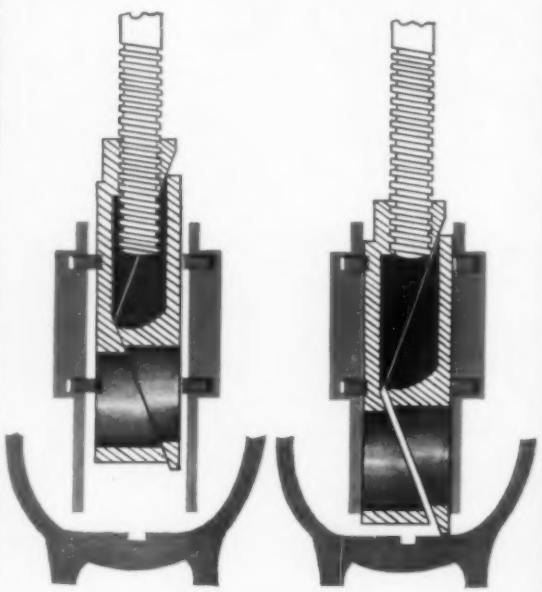

INTERMEDIATE POSITION: Exaggerated view showing gate collapsed during opening and closing. Notice the Teflon seal retains contact with gate and segment. Foreign matter cannot fall into valve body.

CLOSED POSITION: Metal-to-metal forced seal with Teflon compressed into seat by parallel expansion of gate and segment. The Teflon wipes the metal surfaces clean for perfect seal.

**PAT. PEND. †DU PONT'S TETRAFLUOROETHYLENE RESIN. © 1957, acf INDUSTRIES, INCORPORATED. *TRADEMARK OF acf INDUSTRIES, INCORPORATED.

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7-9 American Gas Association, annual convention, Kiel Auditorium, St. Louis.

7-11 American Institute of Electrical Engineers, fall general meeting, Morrison Hotel, Chicago.

10-11 California Natural Gasoline Association, thirty-second annual fall meeting, Huntington-Sheraton Hotel, Pasadena.

10-12 American Society of Mechanical Engineers, American Institute of Mining, Metallurgical & Petroleum Engineers, fuels conference, Chateau Frontenac, Quebec.

10-13 Louisiana Gulf Coast Oil Exposition, Lafayette, La.

13-15 American Association of Oilwell Drilling Contractors, seventeenth annual meeting, Mayo Hotel, Tulsa.

13-19 OIL PROGRESS WEEK.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Southern California petroleum section, fall meeting, Biltmore Hotel, Los Angeles.

17-19 Four Corners Geological Society, second field conference, Gallup, N. M.

18 American Institute of Chemical Engineers, South Texas section, twelfth annual technical meeting, Moody Convention Center, Galveston, Tex.

20-22 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Peabody, Memphis.

23-25 National Association of Corrosion Engineers, western region, seventh annual conference, U S. Grant Hotel, San Diego, Calif.

23-25 National Association of Corrosion Engineers, seventh biennial Permian basin corrosion tour, Midland-Odessa area, Texas.

24-25 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

25 Natural Gasoline Association of America, southern regional meeting, Washington-Youree and Captain Shreve Hotels, Shreveport.

27-29 Independent Petroleum Association of America, annual membership meeting, Statler Hilton Hotel, Dallas.

31-Nov. 1 American Association of Petroleum Geologists, Mid-Continent regional meeting, Education Building, Fairgrounds, Tulsa.

NOVEMBER

3-8 Society for Nondestructive Testing, second international conference, Hotel Morrison, Chicago.

6-8 Gulf Coast Association of Geological Societies, seventh annual convention, Roosevelt Hotel, New Orleans.

6-8 Society of Automotive Engineers, national fuels and lubricants meeting, Hotel Statler, Cleveland.

11-14 American Petroleum Institute, thirty-seventh annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

12-14 National Association of Corrosion Engineers, northwest region fall meeting, Penn-Sheraton Hotel, Pittsburgh.

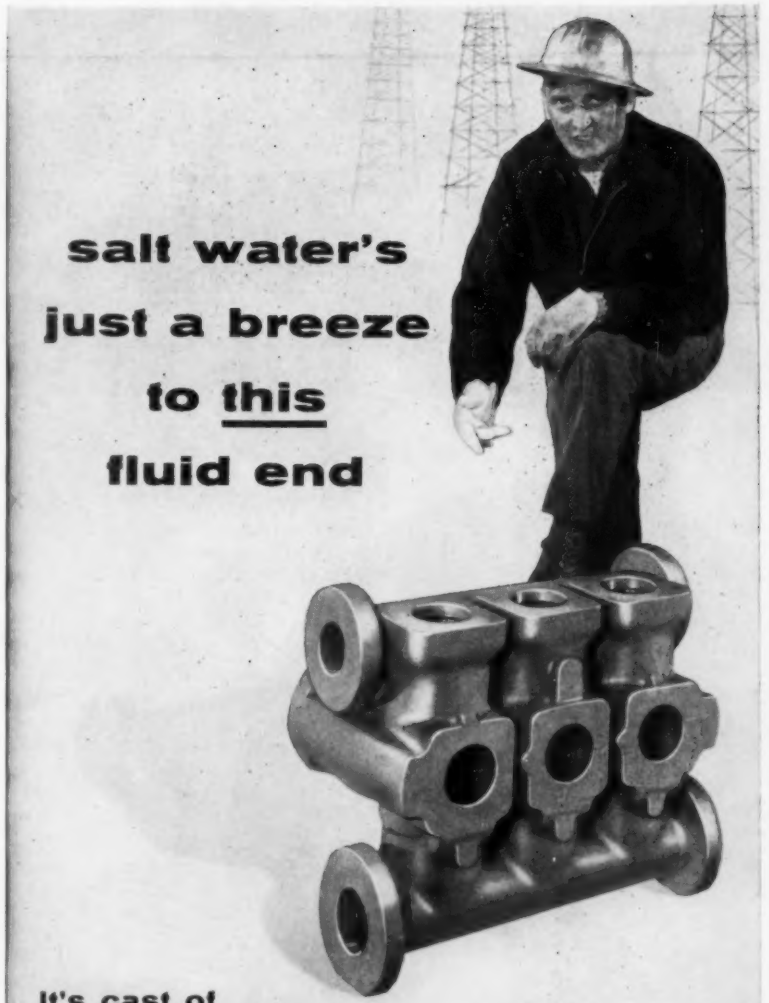
22 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

DECEMBER

1-3 Interstate Oil Compact Commission, annual meeting, Tulsa.

1-6 American Society of Mechanical Engineers, annual meeting, Statler Hotel, New York.

8-11 American Institute of Chemical Engineers, annual meeting, Conrad Hilton Hotel, Chicago.



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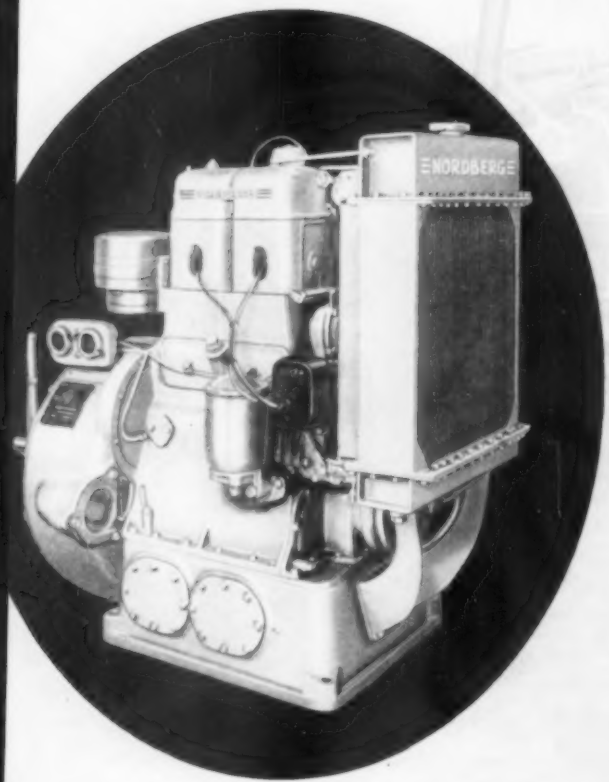

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JOURNALLY SPEAKING

A Study in Smear

IT'S PRETTY WELL conceded that oil men, by and large, are babes in the woods when it comes to public relations. They can't understand why the oil industry is so suspect with the general public, why the ordinary man in the street has the idea that oil is composed of ruthless robber barons bent on rooking the customers at every turn.

Some light on how this comes about can be had from a review of how the fable of the "International Oil Cartel" was synthesized and fostered. It's a case study in the technique of smear propaganda.

A couple of weeks ago a federal District Court in New York dismissed a Government suit which had alleged that two American oil companies had charged excessive prices for oil sold in Europe in 1951. The companies said they were gratified. The fact is that for 5 years they have been crucified.

It started back around 1948. The war had disrupted the marketing pattern for oil in Europe. Formerly most of it had come from the Western Hemisphere. Now most of it was coming from the Middle East. Prices were high at first. Then competition brought them down. Finally a new price structure for Middle East oil in Europe became established.

About that time an investigator on the staff of the Federal Trade Commission made a study of European oil prices. His own personal conclusion, based on information he gathered himself, was that the companies selling to Europe had got together and fixed a price for oil that was higher than it ought to be.

This man's evidence and conclusion were not subjected to cross examination or rebuttal. No hearings were held. The FTC refused to give credence to the report, and stuck it in the files.

Then came 1952 and a presidential campaign. To discredit business in general and the oil business in particular, some folks in the administration dug out this staff study, made a big publicity splash with it, and implied that it proved that American oil companies operating abroad were tied in a cartel to rig prices.

Just before the election a series of suits were filed against various of these companies. The Government alleged that some of its Marshall Plan funds had been used to buy oil at prices higher than the "prevailing market price." The Government later conceded that the companies acted in good faith, and the suit was tried on the basis of a technical violation of a regulation.

But the smearers conceded nothing. They magnified the charges. Foreign governments all over the world were told, in effect, that the United States Government considered American oil companies to be crooks and cheaters. This undermined the position of every American operator abroad, whether or not it had been named in the suits.

The suits weren't brought to trial for several years. But the fact that they were pending was wrapped up with the FTC staff "cartel" paper and touted as "proof" that all large oil companies are a bunch of skunks. Unfriendly politicians and writers took up the cry and painted the oil industry as stealing relief funds and pillaging war-torn Europe.

This canard was repeated so often that many people took it for granted, forgetting that an accused should be considered innocent until proved guilty. Even some in the oil industry accepted it, forgetting that a smear against one part of the industry is a smear against all.

Finally, after 5 years, the trial court said no wrong had been done. There was no evidence of a conspiracy nor of price gouging. The oil had been sold at "prevailing market prices." The fact that some bureaucrat in Washington thought that the prevailing prices ought to have been lower than they were didn't make the oil companies crooks.

Dismissal of this case got about 6 inches in the newspapers. If the other suits in the series are dismissed the news probably will get even less space. But will that squelch the fable of the oil cartel? Probably not. Smearers aren't much bothered by facts. They consider a person guilty even after he's been proved innocent.

And what happened to the FTC staff man who wrote that report? He's now an investigator for a Senate committee writing a report on—you guessed it—the oil indusry.

—Henry D. Ralph.

Another successful use for BAKER Packers... parallel string installations

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FEATURES

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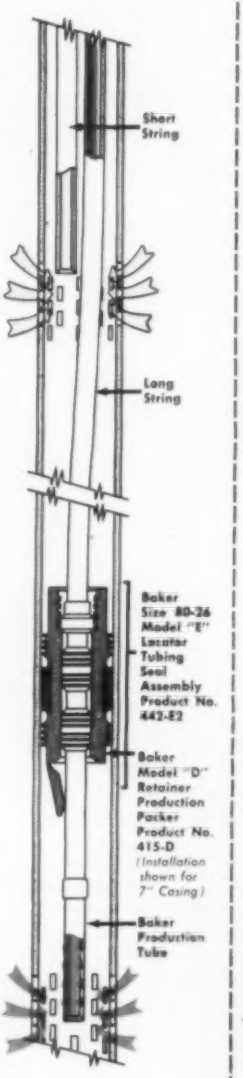
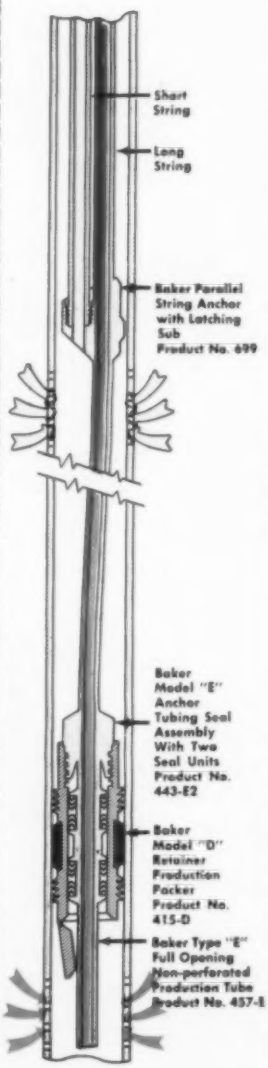

Short String
Long String
Baker Size 80-26 Model "E" Locator Tubing Seal Assembly Product No. 442-E2
Baker Model "D" Retainer Production Packer Product No. 415-D (Installation shown for 7" Casing)
Baker Production Tube

Permits removal of either string independently of the other regardless of sequence. Full-Opening (Tubing I.D.) Long String to lower zone.

DUAL ZONE parallel string SHORT STRING ANCHORED


Short String
Long String
Baker Parallel String Anchor with Latching Sub Product No. 699
Baker Model "E" Anchor Tubing Seal Assembly With Two Seal Units Product No. 443-E2
Baker Model "D" Retainer Production Packer Product No. 415-D
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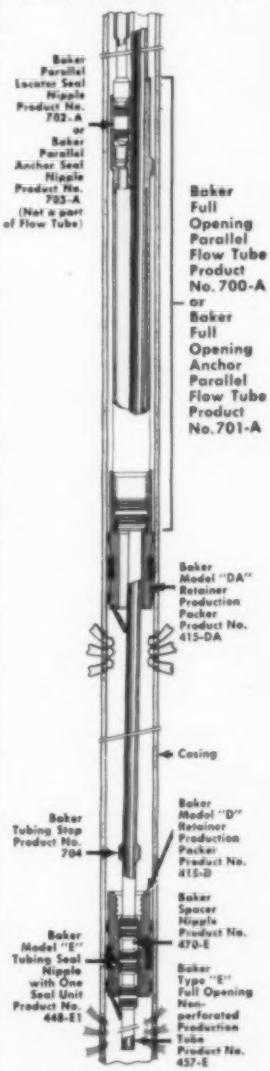
Permits removal of either string independently of the other, however long string must be run first. Short string pulled first. Full-Opening (Tubing I.D.) Long String.

DUAL ZONE parallel string TWO-PACKER HOOK-UP*

*Ask for details of "Retrievable Upper Packer" installations, and other parallel string hook-ups.


Baker Parallel Locator Seal Nipple Product No. 702-A or Baker Parallel Anchor Seal Nipple Product No. 703-A (Not a part of Flow Tube)
Baker Full Opening Parallel Flow Tube Product No. 700-A or Baker Full Opening Anchor Parallel Flow Tube Product No. 701-A
Baker Model "DA" Retainer Production Packer Product No. 415-DA
Casing
Baker Tubing Stop Product No. 704
Baker Model "D" Retainer Production Packer Product No. 415-D
Baker Spacer Nipple Product No. 470-E
Baker Model "E" Tubing Seal Nipple with One Seal Unit Product No. 448-E1
Baker Type "E" Full Opening Non-perforated Production Tube Product No. 457-E

Illustrates Two-Packer parallel string installation with each zone confined to its individual tubing string with full-opening to lower zone for use of all permanent-type completion tools.

Imports aren't cut much, but the gain is limited

THE brickbats that consumer spokesmen are tossing at the President's plan for controlling imports are premature.

It will have no effect on prices. The limitation is so modest in relation to total supply that its effect will be negligible among the many other and stronger factors that influence prices of petroleum products.

Actually, total U. S. crude imports will rise 100,000 bbl. per day above the 1956 level. Thus it is a "paper cut," with its effects largely in the future.

NO ONE IS HURT except 10 companies. Seven large, established importers are cut 10 per cent below their 1954-56 average. The other three must trim their future plans but still can import considerably more than they ever did before. And all importers have had official notice for 2 years that some such action was impending.

Foreign countries have little cause for complaint. There is nothing in the plan to prevent any one of them from selling as much crude here as last year, or more. But they may not be able to increase their U. S. sales as fast as formerly.

For domestic producers it's chiefly a moral victory. Few material benefits will be felt for many months. The cabinet committee figures that domestic production will need to be only 215,000 bbl. per day more than if imports were unrestrained the last half of the year. Texas alone could supply more than that by adding 2 days to its current 13-day producing schedule.

The plan has some arbitrary features, but it is far more liberal, equitable, and simple than most limitation plans proposed. There is a minimum of red tape and regulation for importers, none at all for the rest of the industry. With each importer's allowable set out in barrels there should be no excuse for evading the request for voluntary compliance.

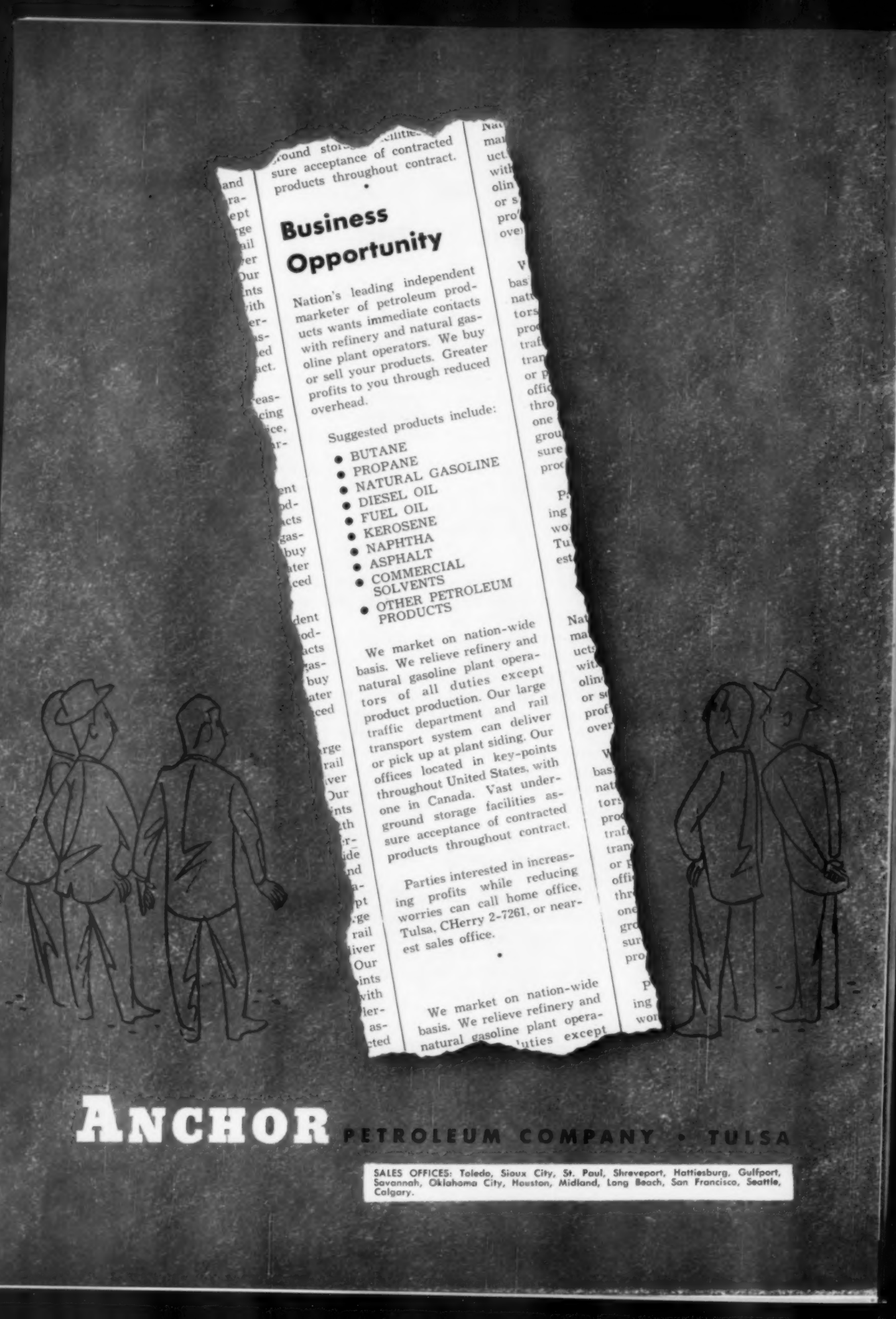
WHAT'S THE GOOD OF IT? Why alarm consumers and discomfit importers to give such small immediate benefits to the domestic industry?

The value lies in having this thing settled. It is officially reestablished that for national security crude imports should supplement but not supplant domestic production. The measure of the supplement has been determined for the next 12 months, and each importer has his allowable.

Now everybody in the industry, here and abroad, knows what to expect and can plan accordingly—that is, for 1 year.

What happens after the middle of 1958? The plan doesn't say, and that's its greatest deficiency. More must be said in coming months if the air of uncertainty is to be sufficiently removed to permit long-range industry planning.

Considering all the pressures under which the committee worked, the plan looks like an excellent solution to a ticklish problem. It offers nothing but help to the domestic producer—even though the amount of help isn't yet obvious.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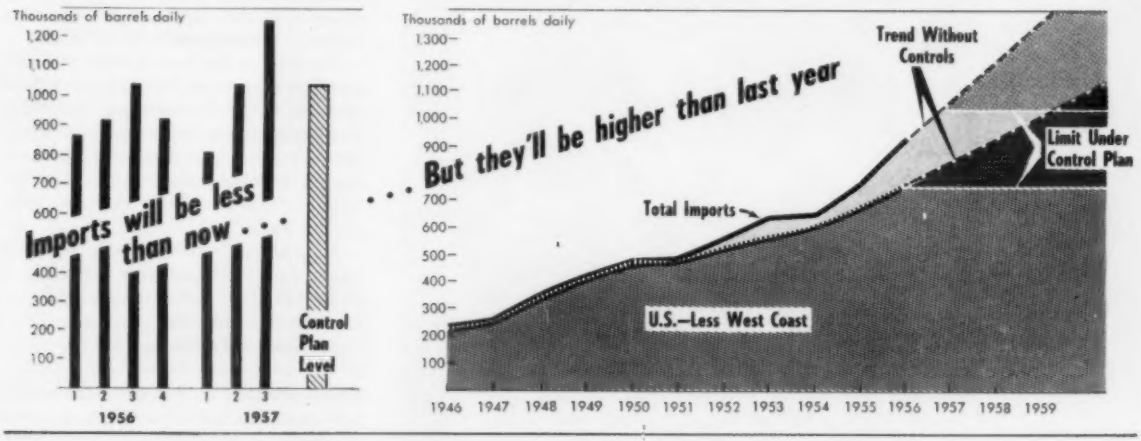
August 5, 1957



Here's What the Imports Order Means

OIL MEN doing business under Eisenhower's new imports-control plan can expect:

. . . **Few immediate direct benefits** to the domestic industry.

. . . **Long-range benefits,** if they develop, to come after the first quarter of 1958.

The imports formula finally revealed last week is now being viewed more as a hold-the-line approach rather than a big rollback.

In general here's what it does:

. . . **Asks importers** to hold their shipments to 1,031,000 bbl. daily, about what they were prior to the Suez crisis. Importers had expected to bring in an average 1,266,700 bbl. daily the last half of this year (see table, p. 44).

. . . **Exempts the West Coast** from restrictions, placing the larger burden for cutting on the region east of the Rockies and also upon seven larger old-time importers.

. . . **Puts no limits on products** imports, principally residuals.

Will it work? . . . This big question was only partially answered with assurances from Standard Oil Co. (N.J.) and Gulf Oil Corp that they will comply.

Proof of the pudding will come when the formula actually starts functioning and the intentions of all importers become clear.

Federal officials admit this will take months. August imports nearly all have been scheduled. Prorated states already have set their allowables for the month. First slackening in imports should start sometime in September.

One critic of the plan, Chairman Olin Culberson of the Texas Railroad Commission, bluntly claims "a similar plan wouldn't work in Hoover's time and it won't work now." He looks for a contest between new and old importers which will cause the plan quickly to founder if not break down completely.

Interior Secretary Fred A. Seaton told newsmen it may be several months before "we know if the voluntary compliance can be achieved." He intimated, however, federal officials had some prior assurances from the oil industry that the plan would work.

The benefits . . . Assuming the voluntary plan works, many economists see long-range benefits—some of them probably psychological.

Imports under the new formula will be limited to 12 per cent of domestic production at least for a year. This is estimated at 9.6 per cent of domestic demand. Under announced company plans, imports were headed for 17.8 per cent of domestic production in the second half, and even more after that.

Over a long pull this cutback could allow U.S. refiners to work off large products inventories and pull down big crude storage. An expected increase in domestic demand then would provide the margin needed for American producers to move more oil to market.

The cutback is not as large as many domestic producers had desired. It won't permit prorated states immediately to shove up allowables much. But it does do one thing: Tries to assure domestic producers 90 per cent of the U.S. market.

This percentage, on a rising demand, will allow increased production in the future.

However, there are indications imports may be allowed to rise also in the future. The special cabinet committee in its report said it preferred to relate imports to domestic demand. It will review the whole plan within a year. So, many assume that if demand has increased considerably within 12 months, the committee will continue its 90-10 formula. This would allow volume of imports to move up with domestic production to share the larger market.

If such a formula sticks for a long period, it also will give these benefits:

. . . **Protect the domestic industry** from being swamped by ever-rising imports.

. . . **Give oil-industry officials** a

How Formula Will Affect Importers

Crude Imports Excluding West Coast

(In Thousands of Barrels Daily)

	1954	1955	1956	3 Yr. Av.	Programed last half 1957	Imports per formula
Established Importers:						
Atlantic	62.7	64.1	69.4	65.4	75.7	58.9
Gulf	117.9	125.2	129.0	124.0	153.0	111.6
Sinclair	65.1	68.8	73.5	69.1	74.6	62.2
Socony	87.2	71.5	65.0	74.6	78.9	67.1
Std. California	70.6	76.7	75.3	74.2	86.0	66.8
Std. (N.J.)	80.7	79.4	79.9	80.0	87.0	72.0
Texas	52.2	65.1	64.2	60.5	74.9	54.5
Sub-Total	536.4	550.8	556.3	547.8	630.1	493.1
New Importers:						
Cities Service	11.3	29.2	25.8		32.6	32.6
Eastern States	4.3	17.2	18.6		18.3	18.3
Gabriel			5.7		7.5	7.5
Great Northern*		6.0	21.1		33.0	33.0
International Ref.*	2.0	2.0	9.2		10.9	10.9
Lakehead*			0.3		0.3	0.3
Lake Superior*	2.0	2.0	5.0		5.0	5.0
Northwestern		2.0	6.0		10.0	10.0
Phillips	7.0	10.6	11.1		12.0	12.0
Shell*		.5	.8		7.5	7.5
Std. of Indiana	15.5	15.0	17.8		49.4	29.8
Std. of Ohio		0.7	1.9		8.2	8.2
Sun	15.1	24.4	38.4		58.4	50.4
Tidewater	5.1	12.9	22.2		84.6	34.2
Southwestern	1.5	5.6	2.1		2.9	2.9
Sub-Total	63.8	128.1	186.0		340.6	262.6
Miscellaneous	4.8	10.1	12.7			
Total Districts I-IV	605.0	689.0	755.0		†970.7	‡755.7

*Importer of Canadian Crude. †District I-IV production required to meet demand would be 6,079. ‡District I-IV production required 6,294.

West Coast Crude Imports

(In Thousands of Barrels Daily)

	1954	1955	1956	3 Yr. Av.	Programed last half 1957	Imports per formula
Douglas		1.6	1.0	0.9	N.R.	N.R.
Socony (Gen. Pet.)	3.5	26.4	32.5	20.8	26.5	26.5
Std. Calif	21.0	17.7	22.1	20.3	68.0	68.0
Shell		6.6	28.1	11.6	56.9	56.9
Texas	10.6	9.4	21.9	14.0	19.0	19.0
Tidewater	13.7	25.0	43.1	27.3	53.0	53.0
Union			11.7	3.9	24.5	24.5
U.S. Oil Ref'g. Co.				0	7.5	7.5
Richfield			1.5	0.5	16.6	16.6
Wilshire			12.2	4.0	24.0	24.0
Others (to bal.)	2.2	6.3	4.9	4.4		
Total	51.0	93.0	179.0	107.7	*296.0	*296.0

*There is reason to believe that the total imports for this period will not exceed 275,000 bbl. per day.

sound basis for planning their refining, exploration, and production programs.

... **Provide incentives** over the long haul for exploring and drilling for new oil to meet the expected tremendous increase in petroleum demand in this country.

The reason statisticians say first measurement of real benefits from the plan will come after the first quarter of 1958 is this: That's when the first realistic comparison can be made.

Imports in the last quarter of 1956 and first quarter of 1957 reversed their upward trend because of the Suez blockade. At the same time, domestic production took an unusually big jump during the emergency. That's especially true of production in the first quarter of 1957.

As a result, production in the first quarter of 1958 probably will show a sharp decline when compared with the same period this year. After that comparisons should be more realistic.

Other effects . . . Seaton in evaluating effects of the imports control on prices of gasoline and other products said: "I hope it will have none."

It's too early to tell the story on prices. The tendency, however, should be to strengthen product and crude prices. Result of the formula will be to force many refiners to use more domestic crude over cheaper foreign crude. That will add to their costs.

With the flood of foreign oil dammed off, domestic crude later might command a higher price. It's due another price increase on the basis of added materials and labor costs alone since January. But future market conditions will determine the price.

Other segments of the oil industry expect these effects:

... **Supply companies** servicing oil men look for their sales to pick up as drilling and production gradually are revived.

... **Tanker operators** may feel an early pinch which could force retirement of some older ships. But they are counting on the future upward trend of world demand to give them steady business.

... **Foreign operations** by American oil companies likely won't be curtailed. Many companies making foreign investments are betting on the future. They see a time coming when this country will need more imports to meet requirements which domestic production won't satisfy.

... **Canadian production** to suffer the least—Middle East and Venezuela the most, but none very severely. The bulk of Canadian imports in this country go into the West Coast. Actually all present foreign production for ex-

port to the U.S. will be cut very little—it's just that the expected increase may not materialize.

What's in the plan . . . The 1,031,000-bbl. daily imports would be divided this way:

. . . 756,000 bbl. daily coming into Districts 1-4, the region east of the Continental Divide. That's 12 per cent of expected production in this area.

. . . 275,000 bbl. daily into District 5, West Coast states plus Nevada and Arizona. No restrictions are recommended at present, but the situation will be reviewed every 6 months. Basis for any future action in this area will be: Permit imports to make up the difference between demand and domestic crude available. Present imports average about 29.8 per cent of production.

Importing companies also were given specific treatment:

. . . Seven established importers (see table) were advised to cut back imports by 10 per cent of their 3-year average in 1954-56. The actual volumes were spelled out in detail.

. . . Fifteen newer, smaller importers were allowed to bring in all oil planned under schedules they listed with the Office of Defense Mobilization in July. These imports, however, will not exceed actual 1956 imports by more than 12,000 bbl. daily.

. . . Newcomers in the ranks of importers must advise the Government 6 months in advance of their plans. The U.S. then will determine whether older importers should move over to make room for new companies or if allocations will be given from an expanded market created by increased demand.

The Interior Department will administer the program with guidance from ODM. These special rules were set up:

. . . Imports are for direct account of importers and no transfers of allotments are permitted.

. . . Annual review should be made of the plan on this assumption: Effort should be made to maintain imports at 12 per cent of domestic production in Districts 1-4 and the difference between demand and domestic production in District 5.

. . . Interior Department in administering the plan should arrange for hearings in cases where inequities would result.

Interior Secretary Seaton quickly named Navy Capt. Matthew V. Carson, Jr., to administer the program. Carson once was counsel and director of Naval Petroleum Reserves. He will be a special assistant to Seaton.

Carson apparently will have the job of reviewing operations of the program. He will receive applications of new importers, make reports whether the plan is working, and contact oil companies on plans and compliance.

The cabinet committee in recommending the plan which the President approved said it found imports were a threat to national security unless they were reduced. It recommended that the committee not be dissolved pending outcome of the voluntary program.

INTERIOR SECRETARY Fred A. Seaton clarifies a point in the Government's new imports policy for news men at a press conference. At the left is James C. Hagerty, press secretary to President Eisenhower. The conference was held in Hagerty's White House office.

The reaction . . . The general public and even leaders within the oil industry immediately took sides on merits of the new imports action.

Politicians generally followed the economic interests of the areas they represent. Sen. Frederick G. Payne of Maine led off for the consuming areas with no oil production. He termed the plan "shocking favoritism for the oil industry." Sen. Joseph C. O'Mahoney of Wyoming, often an oil-industry critic, said the program has "gaping loopholes" and he doubts it will work.

Ernest O. Thompson took an opposite tack from his colleague Culberson. Thompson praised the action as a sound program and said "it will put our rigs back to work and start up exploration."

Culberson charged the reduction was not enough, adding Texas' share of the cut would be less than 90,000 bbl. daily or less than ½ bbl. a day per well.

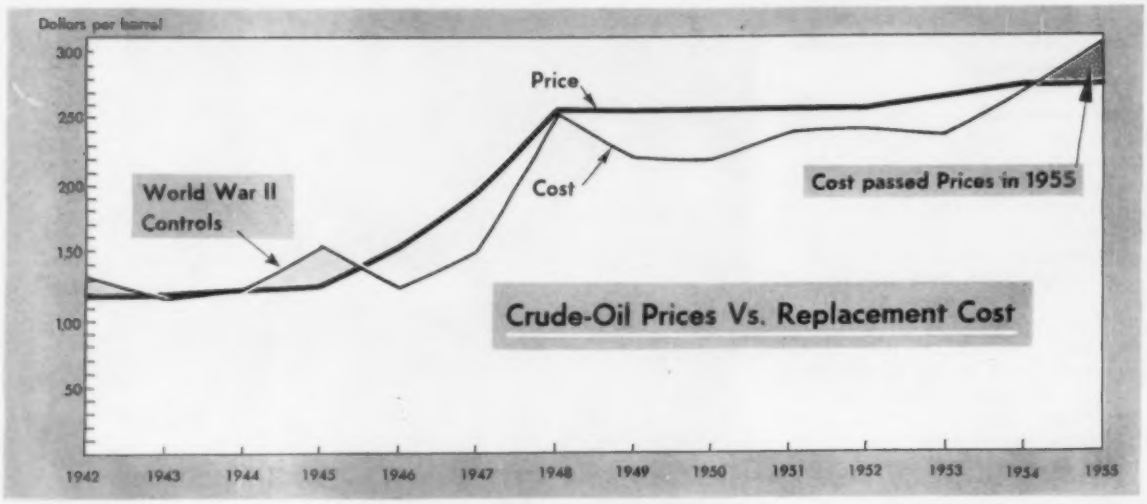
Sen. Lyndon Johnson of Texas praised Eisenhower's recommendation as a move to strengthen national security and permit domestic oil producers to increase their production.

Within the industry Jersey Standard Chairman Eugene Holman called the plan approved by Eisenhower preferable to imposing mandatory controls. He said Jersey's importing affiliates would comply.

Gulf's executive vice president, David Proctor, also was pleased with the voluntary aspects of the plan. He said Gulf would divert some of its overseas production to other marketing areas and step up its domestic production and oil purchases.

TIPRO President Jerome J. O'Brien called Eisenhower's action a recognition that level of imports was too high. But he claimed the plan didn't cut imports enough, had no enforcement machinery, put no limits on imports of products, exempted the West Coast. He objected to all four provisions.

Officials of I.P.A.A., leaders in the fight to control imports, reserved comment. Instead a meeting of the I.P.A.A. executive and imports policy committees was called for Dallas this Monday to study a future course of action.



In Oklahoma and Kansas . . .

Replacement Costs Top Crude Prices

IT COSTS MORE to find and produce a barrel of Oklahoma and Kansas crude oil today than the producer is getting for it.

This is the conclusion of a comprehensive study just released to the Journal by Carter Oil Co.

The study shows, for example, that:

. . . **Replacement costs** climbed above crude-oil prices in 1955 after an 8-year period in which prices were ahead.

. . . **Total expenses** of the oil industry have exceeded revenue from the sale of crude and natural gas since 1952.

"Some people believe the oil industry is a one-way street to riches," says one Carter economist.

"But the truth is that the industry in Oklahoma and Kansas has not had, in spite of improved efficiency, sufficient price increases to offset rapidly rising costs.

"Furthermore, there is no reason to believe that costs will not continue to rise in the future."

What was found . . . The study was made by Carter's economics department. It covers the 14-year period 1942 through 1955. Here are its principal conclusions.

. . . **It was touch and go** during World War II as to whether replacement costs would be higher or lower than revenue from the sale of crude.

. . . **Revenue was higher** than replacement costs from 1946 through 1954.

. . . **Replacement costs** caught up with, and passed, crude-oil prices by 1955. In dollars and cents, the crude-oil price in 1955 was $2.78 per barrel, while the replacement cost per barrel was $3.07, a red-ink spread of 29 cents.

Figuring another way—cash income vs. cash outgo—the oil industry in Oklahoma and Kansas was able to stay in the black every year from 1942 through 1951.

Then came the switch. In 1952, income was $743 million, while cash outlay was $757 million. In 1953 and 1954, the spread was even greater. In 1955, the income figure was $873 million, and outgo was $890 million.

However, because a number of variable factors affect cash income and expense, Carter economists prefer replacement costs as a more reliable index of business conditions for the oil industry.

They break down replacement costs into three categories: (1) finding oil, (2) developing production, and (3) operating expenses.

Finding oil consists of geological and geophysical activity and other exploration costs, including all dry holes. Developing production consists of drilling and completing producing wells and other expenses required to get a field well into production. Operating expenses consist of administration, operation of wells, and obtaining oil drilling rights.

The three categories, when combined, represent theoretically what it would take to replace a barrel of crude oil that is sold.

The breakdown . . . The sharpest rise has come in the cost of finding oil.

In 1942 this was 46 cents per barrel. The figure dropped to 13.7 cents in 1946, and then the rise started. By 1955, it reached the astronomical sum of $1.65.

The cost of developing production did not experience such a dramatic rise, but it soared by more than one-third. In 1942 the cost per barrel was 39 cents, while in 1955 it was up to 53 cents.

Actually, the cost of developing production had an up-and-down history during the 14-year period. The peak cost year was in 1953, when the figure was 68 cents. This dropped to 58 cents in 1954 and to 53 cents the final year of the survey period.

Operating expense produced another financial headache for the oil man in Oklahoma and Kansas. It nearly doubled between 1942 and 1955—from 46 cents to 88 cents. The rise was steady to a peak of 89 cents in 1954, and then came a 1-cent drop.

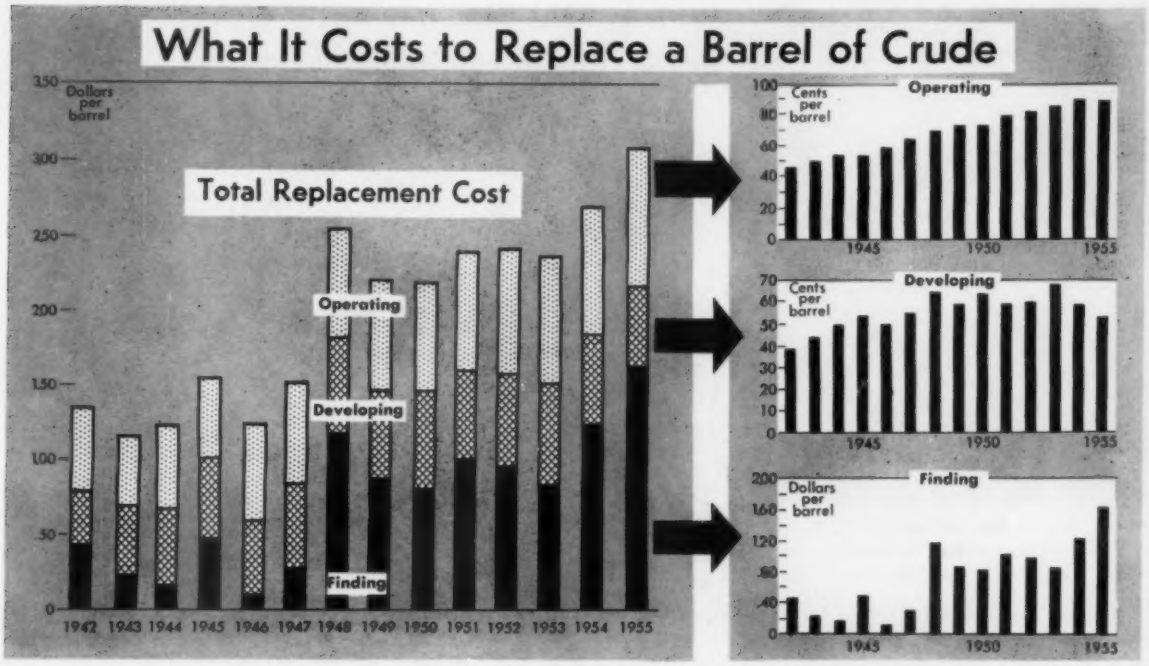
The full story of oil costs is told in the totals struck by the research team. This is what the three categories, combined, show:

. . . **In 1942** the replacement cost for a barrel of crude oil was $1.33 and a year later was down to $1.18.

. . . **In 1955** this figure had skyrocketed to $3.07.

Comparing replacement costs with the price of crude, year by year, this is what the survey found:

. . . **During the war years** replacement costs generally were higher than



crude prices because of government price controls.

. . . Starting in 1946, the oil industry moved "into the black" for an uninterrupted period through 1954.

. . . Then in 1955 inflation caught up. The results: crude oil sold at $2.78 per barrel; replacement cost was $3.07.

What's happened since? . . . What about costs and crude prices since 1955? While study does not project into the 19 months that have followed the survey period, there is little doubt that conditions have worsened for the oil industry.

There has been one crude price increase of 25 cents per barrel for the Oklahoma-Kansas area. But look at costs:

. . . Wages have gone up each year. In 1955 the average oil-production wage for the nation was $2.32 per hour. Today it is $2.67, a boost of 35 cents.

. . . Steel has increased in price three times, and the oil industry's costs went up each time.

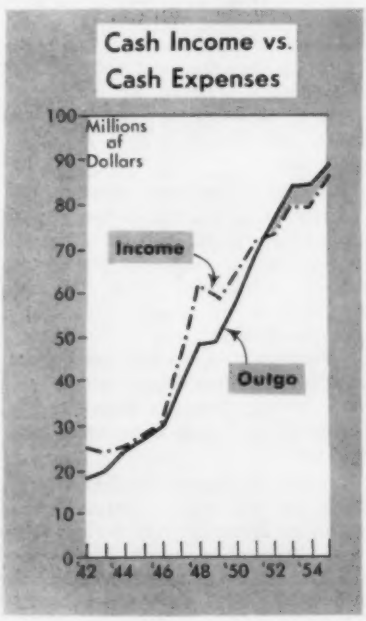
. . . The trend toward drilling deeper and more expensive wells has continued—and the percentage of dry holes is on the rise.

The Carter economists were able to determine costs for the entire area by obtaining correlation factors that can be applied to all companies operating in Oklahoma and Kansas. A number of producers in the area cooperated with Carter by furnishing statistics needed to make the findings authentic.

While there is no area in the United States "typical" of the entire industry, the researchers believe that Oklahoma and Kansas come close to qualifying for this designation.

The gas industry was excluded from the survey, except that the exploration costs on fields which became gas producers were included in the category of finding oil. Not until the latter years of the survey period did natural gas become a factor in exploration and production.

The big picture . . . The economists calculated that income from sale of



crude oil in Oklahoma and Kansas was $7.6 billion over the 14 years.

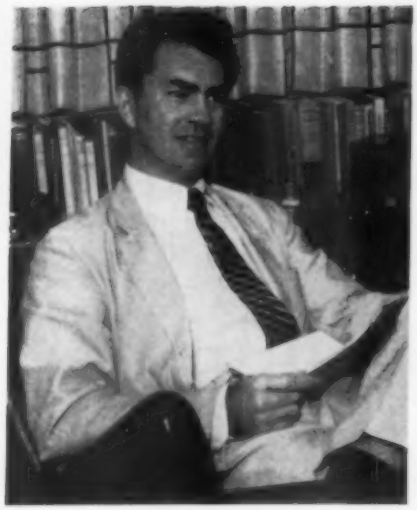
While this figure is greater than expenditures during the same period, the margin has narrowed in recent years to the point where the trend is now reversed.

For the full 14 years, the industry spent $7.2 billion for exploration, development, and operations. When the cost of finding gas fields and developing water-flood projects is eliminated, the spending figure can be cut to about $6.5 billion. This amount would have been higher had it not been for cutting exploration during the war.

Some may spot an apparent paradox when they compare the narrow margin on which the industry is operating today and the fact that annual statements of oil companies show healthy profits. One explanation is this: Much of the oil marketed today was discovered many years ago when exploration costs were low.

By the same token, the industry hopes that new reserves, discovered during a period of high exploration costs, will be marketed in the future at even higher prices. Should prices fall instead, as they did during the depression years of the 1930's, many companies would quit exploration to avoid financial disaster.

Considering it all, the Carter economists reach this conclusion: If replacement costs were the only factor considered, the oil industry—at least in Oklahoma and Kansas—should have had a price increase for crude a full year before the increase actually occurred last January.



WALT HELMERICH III
. . . Savings are hard to come by

With a bold new approach, one drilling contractor found . . .

How to Keep All Rigs Busy—and at a Profit

J. C. Bradford
District Editor

TULSA.—Helmerich & Payne, Inc., was ready to quit the drilling business less than 4 years ago.

But the veteran outfit today has more business than ever. It has held the line on profits in the face of a general drilling-industry slump. It has the air of going places with no idea of quitting.

What happened?

Helmerich & Payne found the cure for its sickness in a custom-tailored program that put its rigs to work and halted skidding profits despite cutthroat bidding in the industry.

In brief, company management did this:

. . . **Started a cost accounting** system that keeps close controls over every item of equipment, material, and labor.

. . . **Began a training program** to make crews more efficient.

. . . **Drew up a new bidding form** listing costs item by item so company representatives can bid intelligently on every job.

. . . **Sold the program** to top management and drilling engineers of the operating oil companies.

Why the change . . . It was in 1954, during another period of drilling doldrums, that Helmerich & Payne decided it had to make a choice: Quit or make some drastic changes in ways of doing business.

Stacked rigs were costing the company $100,000 a month. It was after 6 months of this, that H. & P. took a look at its hole card. Officials decided there was still room in the drilling business—but only for an efficient operator.

H. & P. had been in business for 34 years. Old hands had been through the perpetual feast-and-famine cycles of the drilling game. But they felt times were changing. The feasts were not so tasty. The famine periods were tougher.

W. H. (Walt) Helmerich III, executive vice president, was handed the job of changing the firm's business pattern. He first wanted to find out just where the company stood—how much it was spending and how much it was making. To do this he called in four business experts to draw up for management a new system of operations and put it into effect.

The men involved . . . Helmerich finally rounded up this team:

. . . **Dr. Robert W. Haigh** put a cost accounting system together. He was a professor at the Harvard Graduate School of Business and coauthor of an important textbook on the development and integration of the oil industry. Dr. Haigh is now H. & P. controller.

. . . **Robert Gambrell** installed the cost controls. Gambrell has a rare background for the job. He is a graduate accountant who went into the oil fields as a roustabout soon after college because his chosen field didn't offer much opportunity in those days.

He worked up to tool pusher and later became chief accountant for another drilling contractor before joining Helmerich & Payne as assistant controller.

. . . **Sam J. Brown,** another college professor, was made contract representative. Brown taught in the business colleges of two universities, Texas and Tulsa. One of his first moves was to turn thumbs down on the old practice of handing out "gratuities." He started selling the company strictly on the service it had to offer.

. . . **Lee Daniel** became drilling vice president. Daniel formerly owned his own drilling company in California. He was selected because Helmerich felt "his ideas on drilling operations fit in perfectly with our new program."

1. The Program

H. & P.'s new system has two basic concepts: Separate contract drilling from all other company operations and keep cost controls.

The result now is that company officials can tell exactly how much the company makes—or doesn't make—on every drilling job. Not only that, they can spot even the smallest piece of equipment which fails to carry its share of the load.

For example, the company keeps tab on every item on the rig—from the smallest to the largest. This inventory covers purchase price, operating life, number and frequency of breakdowns, cost of maintenance, and so on down the line.

It took 2 years to build up these case histories on rigs and operating parts. H. & P. feels the results are worth it. Now the company can tell such things as what wire line is best, whose draw works or pump is most reliable, and which drill bit works best in what areas.

This information is put to excellent use when ordering replacements or assembling a new drilling rig. Then H. & P. can install the equipment which gives the best service and thus makes the most money for the company.

They wouldn't believe it couldn't be done. So this team found the answers to cost controls and operating efficiency—and how to sell them to crews as well as oil-company management

Left to right: Sam Brown, sales; Bob Gambrell, controls; Helmerich; Bob Haigh, accounting; Lee Daniel, drilling. All are under 35.

After examining equipment costs and efficiency, company officials turned to other costs. Their program actually was not new to the industry as a whole but they extended it further.

The familiar practice is to list labor costs in one column and lump the balance of spending in another column under operating costs. This was not detailed enough, as Helmerich explains:

"It's easy to run your business 90 per cent right, but when you start trying to cut into that top 10 per cent the bind gets tight. There you are dealing with dollars and cents—not big money—and it's an area where savings are hard to come by. But that 10 per cent can mean the difference between failure and survival. And it's getting more important all the time."

So H. & P. decided to break down every item of cost, however small.

All these were placed on a new bid sheet which showed what a prospective job would cost. In addition the bid sheet carried the break-even price and the percentage of profit H. & P.'s bid would give it.

Final phase of the new H. & P. approach was to step up efficiency of the drilling crews, sell all employes on the plan, and tell the story to customers.

2. The Selling Job

When the finished plan was laid out for scrutiny, old hands shook their heads.

The controls were too tough, they said. You would never get drilling crews and tool pushers to live with them. And they just wouldn't supply the information needed to put the plan across.

The old hands were almost right. The task wasn't easy. But it wasn't impossible, either, and the men in the field finally "bought" the plan and are now backing it to the hilt.

"Tool pushers are proud of their rigs," Helmerich says, "and none wants to be cast in the role of being the least efficient. So we hit on the idea of circulating charts giving a running account of how work is going at each rig."

The charts not only show how fast footage is being made, but such things as the number of breakdowns and fishing jobs and which pusher is using the most oil. They are also helpful in supplying management with up-to-date progress reports.

As further insurance for putting the program across, H. & P. also:

. . . **Distributed policy manuals** explaining the plan to all district managers, district engineers, and tool pushers.

. . . **Scheduled monthly meetings,** which are still being held, with these men to explain further what the company is trying to do.

. . . **Obtains all geological** and geophysical information available about the area where the company is to drill. The information is passed on to the pushers, who then have a better idea of what they are likely to run into after drilling has started.

Selling the operators . . . Helmerich & Payne is more than pleased with the reception the program has been getting from oil-company executives. The job of explaining it to the customers fell to Walt Helmerich III.

"When you approach a president with something pertaining to drilling," Helmerich says, "his first reaction is to refer you to the drilling department.

"But many times, what starts as a 5-minute interview turns into an hour's discussion when he learns what we are trying to do. Usually, he wants his vice president in charge of drilling operations to hear our story and then we go right down the line until we have talked to just about everybody in the company who has anything to do with drilling."

One place where H. & P.'s bid form shines is during these talks. The form is similar to the one being pushed by the American Association of Oilwell Drilling Contractors, except that H. & P.'s has more detail.

An executive of one major oil company said it "goes further than any we have seen" among drilling contractors.

Another said it is "something we need more of. I was highly impressed and gave them much encouragement. It is definitely a new approach, a progressive step that others need to follow."

One summed up its value this way:

"You have two kinds of contractors. One is doing a lot of crying about losing money—and he probably is. The other is making money. The difference is cost accounting. If you don't know where you are spending your money, you don't know where you can cut costs."

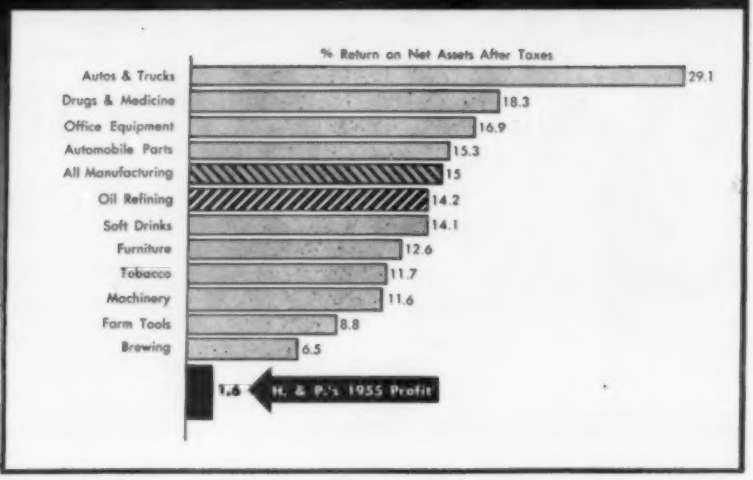
3. Some Results

All of H. & P.'s problems have not been miraculously swept away by the program.

The company is still cutting its prices well below what it considers a fair rate of return. Any contractor who gets jobs these days has to.

But the H. & P. name has been placed on the bid lists of three majors where it didn't appear before it started taking the program to man-

The Investment . . . And H. & P.'s 1955 Return on It



26 rigs—21 in the U. S. and 5 abroad—tie up a lot of capital.

H. & P. uses this chart to prove that contract drilling is a bargain. Since the program started—and this chart was new—the profit picture has improved.

agement. And prices on some jobs have been revised upward after H. & P. was able to show exactly what its profits were—and prove they were too low.

In one instance, H. & P. drilled three wells in one area for a major. When a fourth well came up for negotiation, H. & P. might have been expected to accept a lower price. Its rig would have to be moved only a short distance. Its drilling crews were familiar with the area and should be able to make hole faster.

Instead, H. & P. showed the operator its cost sheets on the three wells already completed. The contractor had made a 3½ per cent profit. Three days later the operator raised the price 50 cents a foot on the fourth well, giving H. & P. an additional 5 per cent profit. The job could have been "bid out" at a lower figure.

The big payoff . . . As far as H. & P. is concerned, however, the key result is this:

All of its rigs are running—and at a profit. What's more, the jobs are all blue chip, most of them with majors, the others with top independents.

H. & P. has 21 rigs, all deep rotaries, operating in the U. S. Early this month, it picked up four more deep rigs and one shallow rig from Sinclair Oil & Refining Co. in Venezuela.

In contrast to its present "full stable" of busy rigs, the company had only 10 outfits running last April, the time it started telling its story to operators. And that had been about par for the course a lot longer than H. & P. cares to remember.

The company knows that one swallow doesn't make a summer, that more time is needed to determine whether the program will be a lasting success. But it considers this significant:

When the company started laying its cards on the table for operators to see, the number of busy rigs at H. & P. started to climb. And all rigs have been running for the past 3 months.

4. What's Ahead

H. & P. is making no guesses on how long the current drilling slump will last.

Young Helmerich feels, however, that unless drilling picks up soon—and prices along with it—there are bound to be casualties among the contractors. Already some are liquidating their idle rigs.

"You can work dirt cheap," Helmerich points out, "when you don't include replacement costs. On a 13,000-ft. hole, for example, you can knock close to $20,000 off your price if you don't depreciate your equipment. That's more than $1.50 a foot. That will get you more jobs and it will put more money in the till for a while. But eventually, when the time comes to replace your rigs, you find yourself out of business."

Company rigs again? . . . As a matter of fact, H. & P. is certain the operating companies will find themselves back in the drilling business if the situation doesn't change.

It won't come for a while—it takes time for a contractor to run out his rigs when he can keep stripping one down to get replacement parts for others. But the situation is already in the making, the company claims.

"Take our firm," Helmerich says. "I think we made as good a profit as most contractors last year, but it still wasn't as much as we could make putting our money in Government E bonds where there isn't any risk involved."

But H. & P. is not just singing a sad song while Rome burns. It firmly believes operating companies want to pay enough to keep contractors, who unquestionably can drill cheaper, in business. And it feels H. & P.'s new system puts the issue squarely up to the customer by telling him two things:

. . . H. & P. is cutting costs to the bone.

. . . Just what rate of return each drilling job brings.

H. & P. thinks its program is best suited for contractors operating deep rigs. One reason:

Labor costs, which can't be cut, run about 80 per cent of total costs where shallow rigs are concerned. On deep rigs, however, labor accounts for only about 60 per cent of the spending, leaving a much wider area in which to cut costs through efficiency.

100-rig contractors? . . . Not only does Helmerich feel that contractors are here to stay, he thinks also that 100-rig firms are just around the corner.

And he predicts that in a few years,

maybe as few as 10, drilling on a big scale will be handled by only a half-dozen companies.

The local contractor, who operates a few rigs and never moves them farther than a few miles, will always be around, he thinks, but most of the others will either fold up or merge.

What about profits? . . . And what margin of profit does Helmerich think contractors should get?

Twenty per cent before taxes would be fair, but 30 per cent is not out of line.

This return is based on investment, Helmerich stresses. Basing returns on gross income, he says, has trapped the contractor and is costing him money.

Helmerich points out that 30 per cent profit would put drilling-industry earnings up among those of industries in the average-income bracket.

"It would benefit everybody, including the people who pay it," he declares. "Many companies in other industries are spending as much as 20 per cent of profits on research. Think how much progress we could make if the drilling industry could spend 10 per cent. We would be far ahead of where we are now in making hole."

As far as H. & P. is concerned, the company is still not anywhere close to that goal. But its situation is a far cry from what it was 3½ years ago —when the company was thinking about quitting the business. And its position is getting better all the time.

A 10-Year Look at Oil's Capital Expenditures

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1947-1956
	Million Dollars										
Production:											
Crude oil and natural gas*	1,700	2,000	1,890	2,025	2,575	3,125	3,400	3,700	4,050	4,375	28,840
Gasoline and cycling plants	50	100	110	75	75	75	125	100	50	100	860
Total	1,750	2,100	2,000	2,100	2,650	3,200	3,525	3,800	4,100	4,475	29,700
Transportation:											
Pipelines	170	210	175	200	250	335	325	275	190	175	2,305
Marine	125	100	75	15	35	50	100	50	35	50	635
Other	15	15	20	10	15	15	25	25	15	20	175
Total	310	325	270	225	300	400	450	350	240	245	3,115
Refineries and Chemical plants	400	600	420	275	325	470	675	800	835	825	5,625
Marketing	300	225	240	275	300	280	325	350	375	450	3,120
Others	65	100	70	50	50	50	50	50	50	,55	590
TOTAL—All Departments	2,825	3,350	3,000	2,925	3,625	4,400	5,025	5,350	5,600	6,050	42,150

*Expenditures include cost of drilling dry holes and lease acquisitions but exclude exploration expenses and lease rentals.

Oil's Investment Hits $70 Billion

NEW YORK.—The world's oil industry set new peaks in production, refining, earnings, and capital expenditures during 1956 to continue the pattern of its postwar growth.

The world's public, not to be outdone by the industry, set new highs in oil consumption during the same year.

All this is contained in detail in the annual analysis of the industry published last week by Chase Manhattan Bank. The annual 44-page study was prepared as usual by Fred Coqueron, petroleum analyst for the bank.

Coqueron bases his analysis of the industry on a study of 33 American oil companies. These companies produced 58 per cent of the oil brought aboveground during 1956. They refined 65 per cent of the free world's oil supply.

The free world's oil industry spent $9,700,000,000 in the United States and abroad in expanding its operations during 1956. This represents an increase of 17 per cent over the same kind of funds spent the previous year. More production facilities, as usual, accounted for most of this—about 61 per cent.

The gross investment in fixed assets in the oil industry at the end of 1956 amounted to $70 billion. Of this total, 62 per cent was invested in the United States, and 38 per cent in overseas operations.

Here are some of the other records for 1956 cited in the bank's study:

. . . Free-world production during 1956 averaged 14,800,000 bbl. daily, or a gain of 7.9 per cent over the previous year.

. . . Free-world consumption of crude oil and products reached a level during the year of 15,600,000 bbl. daily. U. S. demand increased 3.5 per cent compared to 12.7 per cent for other nations outside the Iron Curtain.

. . . Refinery throughput was 14,700,000 bbl. daily, or 8.7 per cent more than during the previous year.

. . . Crude-oil reserves topped 200 billion barrels by the end of 1956, the highest level in the history of the world oil industry. The bank says this is "sufficient to meet demand for many years."

A detailed study of the 33 companies involved in the bank's annual report revealed that:

. . . Net income of the companies amounted to $3,003,000,000, an increase of 12.6 per cent above the previous year. Sixty-two per cent of this came from domestic operations and the remainder from overseas operations.

. . . Cash dividends paid to stockholders reached a new high of $1,268,000,000 or 42.2 per cent of earnings.

. . . Income taxes amounted to $1,850,000,000. Consumer taxes on oil products collected for government agencies amounted to a total of $3,549,000,000.

El Paso making another deal . . .

. . . Big Gas Line to California

LOS ANGELES.—A 500-mile, 30-in. pipeline to bring Canadian gas from the Pacific Northwest Pipeline Corp. system in Idaho to southern California is planned by El Paso Natural Gas Co.

The line would extend from Pacific Northwest at Twin Falls, Idaho, to the California border near Las Vegas, Nev. Southern California Gas Co. and Southern Counties Gas Co. would build facilities from there to take the gas to Los Angeles markets.

Plans for the project were disclosed last week during a hearing before the California Public Utilities Commission, which is investigating the adequacy of the state's gas supply. Grove Lawrence, Southern California vice president in charge of gas supply and transmission, testified to plans for the project. It had been discussed privately in the industry but this was the first time it had been made public.

Lawrence said the southern California companies signed a contract with El Paso Natural for 200,000,000 cu. ft. daily. Delivery of the first hundred million would start by September 1959 and the rest a year later. The plan envisions Canadian imports totaling 600,000,000 cu. ft. daily as California demand increases.

The two utilities have plans to import 1,230,000,000 cu. ft. of out-of-state gas daily within 3 years—all from El Paso Natural.

By this fall, the utilities will be buying 950,000,000 cu. ft. daily from El Paso. They have made a deal for about 75,000,000 more in addition to the 200,000,000 cu. ft. revealed before the C.P.U.C. this week. All the gas comes from domestic sources expect that covered in the latest deal.

The project might be affected by the Government's antitrust suit filed last month to break up the El Paso-Pacific Northwest merger (OGJ, July 29, p. 112). The suit charged the deal contained the seeds of monopoly in the supply of gas in the Far West.

Planning Ahead: Officials of the 1959 International Petroleum Exposition are expecting a big attendance from foreign countries. Scanning a globe of the world, with world-wide attendance possibilities in mind, are William B. Way, left, exposition general manager, and W. K. Warren, exposition president and board chairman of Warren Petroleum Corp. The Nomads will be hosts to delegates from other countries. The 1959 exposition will be held in Tulsa May 14-23, 1959. Previous shows have been represented by more than 50 countries.

Pacific Northwest has contracts with Westcoast Transmission Co., Ltd., for increasing volumes of Alberta and British Columbia gas. Pacific Northwest will start receiving 200,000,000 cu. ft. daily this fall.

The southern California utilities also have an offer of Canadian gas from another source. Pacific Gas & Electric Co., which plans to build a 1,300-mile, 36-in. line from Alberta to San Francisco, would share this gas with the companies (OGJ, July 22, p. 64).

Pollution Is Target

Texas officials step up checks on disposal plans

AUSTIN. — Texas' new attorney general and the Texas Railroad Commission are waving a big stick to stop pollution of fresh-water sources by oil operators.

The commission has been reviewing operators' salt-water disposal practices in recent months. In the past 2 weeks, for example, the commission has checked five fields and ordered several operators in one of them to stop using surface pits for salt water. Disposal practices were approved in the other four.

Atty. Gen. Will Wilson has joined the commission in what appears to be a move toward speeding up that antipollution drive.

Wilson, through the commission, told producers to fill out questionnaires by October 1 on salt-water production and disposal for all leases in Texas. The order was backed up by a commission threat to sever the pipeline connection of any lease unreported by the deadline.

The operator must state the amount of salt water produced by the lease and the methods of disposal. If salt water is "allowed to spill into water courses," the operator must name the watershed receiving the water.

Alberta Areas Leased

EDMONTON.—Two of Alberta's choice oil areas—Pembina and Virginia Hills—brought in $9,434,774 at the latest government lease sale. Thirty-five other tracts throughout the province sold for $1,886,283, running the total for the sale to $11,321,057.

Bids on 16 of the 33 parcels offered in Pembina field were rejected by the government. The 17 remaining parcels brought $3,768,779.

In Virginia Hills, the west central Alberta newcomer, four companies paid $5,665,996 for two parcels containing 92,160 acres each. British American Oil Co., Ltd., and Pan

American Petroleum Corp. teamed up to pay the highest price of the sale, $3,351,859, for one of the parcels. Mobil Oil of Canada, Ltd., and Atlantic Refining Co. paid $2,314,137 for the other.

Field Controls Loom

Rangely operators handed deadline for unitization

DENVER. — Operators have until August 21 to unitize big Rangely field or be shackled by more stringent controls to prevent waste.

The deadline was set by the Colorado Oil and Gas Conservation Commission after the Rangely Operators Committee failed to submit an acceptable unitization program at a July 25 meeting with the five-member board.

The committee was ordered to "show cause on August 21 why the commission should not issue a directive setting forth a method of production designed to reduce flaring in the field." However, the hearing call is broad enough to entertain a motion for unitization of the 476-well Rio Blanco County field if one is presented.

Natural-gas flaring in Rangely is between 20,000 and 40,000 M.c.f. daily. This is in addition to gas being returned to the producing Weber reservoir through 19 injection wells.

If no unitization agreement is presented at the August 21 hearing, the commission said it will issue an order more severe than its directive of July 17, 1956, which limits production to 300 bbl. daily from any one well and requires reinjection of accompanying gas in excess of 180 M.c.f.

Work Begins on Products Line

SHREVEPORT.—Construction will start this week on the 231-mile, 14-in. line from the Little Big Inch products system at Seymour, Ind., to Chicago.

Texas Eastern Transmission Corp. has let contracts to H. L. Gentry Construction Co., Latex Construction Co., and Western Pipeline, Inc. Gentry will build 84 miles starting at Seymour, Latex the next 93.1 miles, and Western the next 38.6 miles.

This major new carrier into the Chicago market is to be finished next month. It will take products from Texas Eastern's Little Inch, which is being converted from natural gas back to products service for which it was built during World War II (OGJ, July 1, p. 88).

watching WASHINGTON

. . . with Bertram F. Linz

Next stop—a tariff? . . .

THE administration's new plan to control imports isn't going to be the last word on the subject.

The plan may last no longer than it takes Congress to get around to writing its own ticket. That will come early next year, when the President asks for another extension of the reciprocal-trade program now due to expire in June.

When the extension bill comes up, congressmen representing oil, china, textile, and many other industries hit by heavy imports will band together for a knock-down, drag-out fight. Their aims will be to reverse the trend of nearly a quarter-century of "free trade" policy. And they have a pretty good chance of doing just that.

Most of the thinking at the Capitol in the past has been along the line of quotas for oil. But ideas are beginning to pop up that a tariff might bring equally good results. A tariff proposal might bring less opposition from consumer representatives than a quota.

Probers eye small refiners . . .

GOVERNMENT officials generally feel that the independent refiner is holding his place in the sun pretty well. But some of the refiners don't agree, and their complaints that they are being squeezed out may lead to another congressional oil probe.

Sen. John Sparkman of Alabama, chairman of the Senate small-business committee, has had the matter under study for some time. It is his belief that the small refiners have lost ground over the last 12 years, and he favors a "bold and imaginative" government program to help them.

Interior Department officials, however, do not see any threat to the independents. They point out that the smaller refiners are still active and aggressive. Many have built new plants and others plan to do so, they say.

A study of concentration in industry released last month by the Senate antitrust subcommittee does not indicate that the major companies have cut deeply into the independents' market in the past few years.

The study showed that the 20 largest refiners accounted for 84 per cent of the 1954 refinery shipments, by value. This was 1 per cent more than they had in 1947. But in the meantime, the value of refinery shipments jumped from $6.6 billion to $11.7 billion.

Economy drive "sinks" tankers . . .

THE administration's shipbui ding program has clashed with its economy drive and has lost the fight.

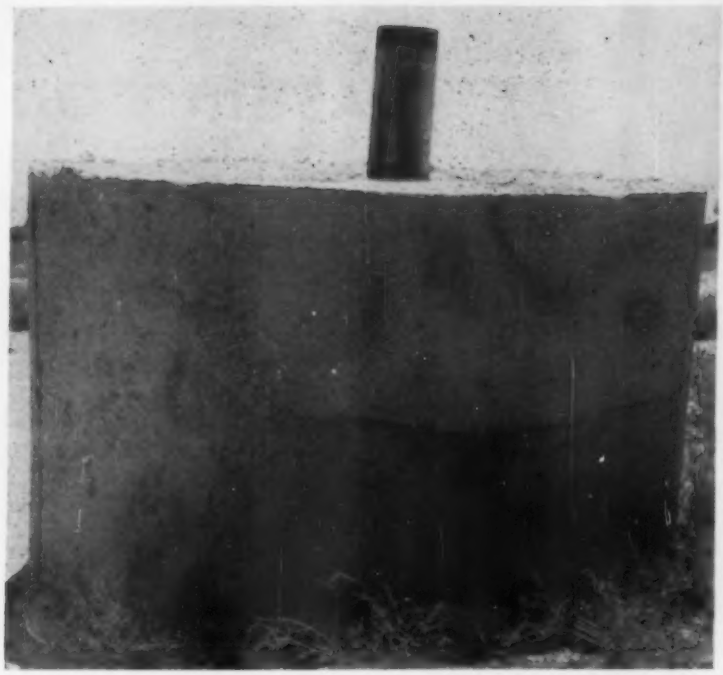
High officials admit that public demand for a cut in government spending has hit their plans to head off block obsolescence of tankers and merchant ships. This plan called for government aid for the building now of replacements that will be needed in a few years.

The pressure for economy may continue for some time, officials say. The prob!em now is to fit a ship program into a shrinking budget.

Tankers are not an immediate problem because of the big building program now under way. About 100 tankers are now under contract in American yards and 25 are actually building. But the 3 million tons they represent is only part of the capacity which will have to be replaced.

Tanker-building aids included the trade-in-and-build and the trade-out-and-build programs. But the former died off after six tankers were built because changing market conditions made the trade-in allowance unrealistic.

The whole question is now under study at the top government level. The administration is expected to come up next January with a new program aimed at preventing a slowdown at shipyards when present contracts have been filled.



HORIZONTAL FRACTURE occurs after perforation in a horizontal plane with the new F.I. tool. Block did not split in two because of the holding action of the pipe cemented in the center.

VERTICAL FRACTURE split the test block. Western's Roscoe C. Clark, director of research, points to holes lined up vertically.

New Tool Controls Well Fractures

MIDLAND, Tex. — Oil men are getting new ammunition in their long hunt for a better way to control the hydraulic fractures they make in wells.

Latest help may be a process introduced by the Western Co.

It aims at controlling:

... **The place** where fracture starts.

... **Direction** the fracture takes.

The goal is to place the fracture at the depth and in the direction—vertical, horizontal, or inclined—that will produce the most oil with the least amounts of gas and water.

The strategy . . . Idea behind the process is simple:

... **Set up a zone of weakness** where a fracture is desired.

... **Point the weak zone** in the direction the fracture will travel.

Western engineers compare their approach to the way an iceman chips a block of ice. When he wants to split a block, the iceman chips a line across it with his pick. This line is a zone of weakness, and the block will split along it.

Fortunately, it's also rather simple to set up a weak zone in the face of a rock. Western is using a jet perforator of a new design to set up the weak zone. Pressure of the fracturing fluid then causes the splitting, or fracturing.

Western expects to make mostly horizontal fractures. These usually drain most formations best. There's plenty of hot argument in the industry about the direction a fracture takes when it gets away from the well bore. But Western officials say field tests support their claim that a fracture they start horizontally usually will stay that way.

Hinges on perforator . . . Western is offering its Fracture Initiation (F.I.) service as a complete package with pump trucks and special fluid.

The process, however, hinges around the new perforating tool. This device jets six holes in the pipe, all in the same plane. Three of the shaped charges fire in one direction to make three side-by-side parallel holes. The other three charges fire in the opposite direction to make another three closely spaced parallel holes.

On test blocks, Western researchers perforated with the tool horizontal. Pumping into the block then made a horizontal fracture. The researchers later turned the tool on its side so the holes would be in line vertically. When fluid was pumped in, a vertical fracture formed, splitting the block.

Spacing is key . . . In designing the F.I. tool, one big question was how close the jetted holes should be.

There already was available a cement-squeeze perforator that shoots four holes 90° apart. Western tried this, but such wide spacing didn't set up the weak zones desired. Cement blocks perforated with this shot spacing fractured in a random manner.

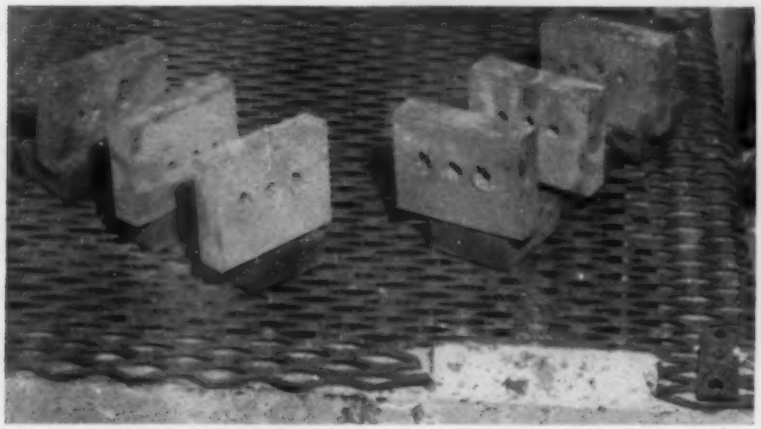
In open holes, there may be zones in the rock face that are naturally weaker than the spot hit by the F.I. perforator. For that reason, Western doesn't now recommend the process for open-hole completions.

Likewise, it isn't recommended for cased wells already perforated in the conventional way. Still, the company has had about 50 per cent success in field trials on open-hole producers, and a better success ratio may be possible in the future.

What tests show . . . The new tool has shown up exceedingly well in field trials in several areas.

In one West Texas field both the oil-water and oil-gas contacts were cut by the well bores. As a result, wells fractured in the usual way always had a high gas-oil as well as a high water-oil ratio. Western used its new process on several wells, placing

The Tool: Two perforating tools, with the one at right opened to show the six shaped charges. Three fire in one direction, the other three in the opposite direction. Outside diameter of the tool is 4½ in.



. . . And What It Does: These mild steel bars were perforated by the F.I. tool. The holes remain the same distance apart as they penetrate the second and third bars. Diameter of the holes and the distance between them are the critical factors in setting up a zone of weakness.

the fracture in the middle of the thin oil column. In each case a good oil producer resulted with very little water and a low gas-oil ratio.

In one California well four zones were fractured and radioactive sand used. In three of the zones later radioactive surveys showed a "kick" exactly where the tool had made the holes. Western engineers concluded that horizontal zonal fractures had been made.

In the fourth zone, there was a kick a few feet higher than the perforation depth, indicating an inclined fracture.

Generally breakdown pressures with the F.I. tool have been lower than with conventional jobs. In several fields operators have taken advantage of this fact to fracture without tubing in wells where light casing made it impossible before.

Western says that one set of F.I. perforations (six holes) will pass 20 bbl. per minute with a pressure drop of 900 psi. About 3 lb. of sand per gallon is the highest concentration yet used, and 90,000 lb. was pumped in one job. The company believes the higher velocities of fluid in F.I. jobs will help prevent sandouts.

The F.I. tool disintegrates into very small pieces when fired. This means there's no need for cleanout afterwards. Also, the tool is very short and can be run with a short lubricator and a light hoist.

And Western hopes to be able to do an F.I. job without the use of a rig or well-service hoist on location.

—— *Industry* briefs

Gulf Oil Corp. has reduced its crude purchases 20 per cent in five states—Oklahoma, Louisiana, Alabama, Mississippi, and New Mexico. The cut was effective August 1. The reduction applies to all leases connected with lines of Gulf Refining Co. in the five states, including crude produced by Gulf as well as that produced by others. Gulf ordered the cut due to lack of storage space.

Pan American Petroleum Corp. 1 University "CS" has set a drilling depth record for West Texas. Last week the well was drilling below 18,913 ft. in limestone and shale, surpassing the old West Texas depth record set by Gulf Oil Corp. 1 P. G. Northrup "A," at 18,709 ft. Pan American Petroleum's well is 13 miles southeast of Fort Stockton, in Pecos County.

The well has had a few shows of gas on drill-stem tests. At 16,307 ft., still in the Permian Wolfcamp, recovery in 1 hour was slightly gas-cut mud. Projected depth is 19,000 ft.

Ginther, Warren & Ginther, Houston operators, have plugged back their Pescadito dome test in Webb County, Southwest Texas, to the Austin chalk. Casing has been perforated from 11,750-11,812 ft. The well was acidized and the operator is trying to test this interval. Attempts to complete in the Georgetown lime from 12,900-14,396 ft. were plagued by mechanical troubles.

A drilling platform will be built 2 miles offshore from Summerland, Calif., in water about 100 ft. deep by Standard Oil Co. of California. Construction will begin sometime next year. Socal jointly owns the 5,400-acre Summerland lease with Humble Oil & Refining Co.

Shell Oil Co. will install automatic custody transfer equipment and centralized production test facilities in Bisti field of New Mexico. A completely enclosed system will transport production from wells to one of several test stations for individual well testing and oil and gas separation.

Gas will then be delivered to purchaser, and oil from all test stations will be collected at a central plant for dehydration and pipeline delivery. Positive-displacement meters for accounting and royalty calculations will be installed at the central plant, as will equipment for monitoring basic sediment and water content and quality sampling.

It's an open-sea assembly line:

New Barge Lays First Pipe

MARINE GATHERING CO.'S barge, the Magic, first vessel specifically designed and built for laying pipelines in the open waters of the Gulf of Mexico, is nearing completion of its first job.

A seagoing assembly line, the 260-ft. barge features a long ramp where crews work simultaneously at five stations. As the welding and coating process is completed, the finished line rolls into the water from dollies mounted on the central ramp.

The Magic's first job is a submarine pipeline consisting of about 25 miles of 6, 8, and 12-in. line in the Grand Isle area off the coast of Louisiana. The line is being built for the C.A.T.C. Group, composed of Continental Oil Co. as operator, Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Co. It will move both crude and gas from Block 47 field to a terminal at Grand Isle.

The pipeline job is the largest project of its kind undertaken in the Gulf of Mexico since completion of a 48-mile line built in the Eugene Island area 2 years ago. The Eugene Island gathering system, the world's longest submarine pipeline, was built for Magnolia Petroleum Co., Continental, and Newmont Oil Co., known as the M.C.N. Group.

Marine Gathering Co., a subsidiary of Commonwealth Oil Co., is the operator of the first major pipeline laid in the Gulf of Mexico. This line moves gas to shore from Rollover field in the Vermilion area off Louisiana.

Merger Plan Voted

Pacific Petroleums joins Merrill in Canadian deal

CALGARY. — Pacific Petroleums, Ltd., and Merrill Petroleums, Ltd., have voted a merger that combines two aggressive Canadian firms—one specializing in gas, the other in oil.

The deal was announced after Merrill's board of directors voted to accept an offer of Pacific to exchange one share of Pacific for two shares of Merrill. Final approval must be voted by Merrill's shareholders.

The merger involves an estimated $200 million worth of assets and reserves and is one of the biggest in Canadian history.

Pacific's attitude was stated by Board Chairman Frank McMahon: "I feel this merger is most constructive and will create a strong integrated independent Canadian company."

Pacific will take over operations of the amalgamated firm upon approval of Merrill's shareholders.

Holdings involved . . . Natural gas is Pacific's specialty. The firm owns a 21.8 per cent interest in Westcoast Transmission Co., Ltd., which has nearly completed a pipeline from gas fields of the Peace River region in Alberta and British Columbia to the U. S. border.

Pacific also holds large reserves of natural gas, a gasoline plant, a refinery, a large marketing outlet system, 7,500,000 acres of exploration land in western Canada, and 175,000 acres in Venezuela.

Merrill has grown swiftly in the past 3 years and today is ranked eleventh among producing firms in Canada. Daily oil production is about 7,000 bbl.

Merrill holds interest in approximately 1,000 producing wells and owns 132 outright. Among its top holdings is 11,429 acres in Alberta's Pembina field.

Court Rules for Oil Firm

AUSTIN.—The Texas Supreme Court has ruled that an oil company has no implied duty to restore damage to land surface following drilling operations.

The ruling upset earlier decisions of county and appellate courts. Warren Petroleum Corp. was the winner in the lawsuit brought by a Harrison County landowner.

The landowner charged that Warren left slush pits unfilled and deep

ruts in a gravel road. The court held that the lease agreement had no provision requiring Warren to repair the damage, and there could be no such provision implied.

Wyoming Well Hits

Pan Am wildcat tests out at over 4,000 bbl. a day

LARAMIE, Wyo.—A wildcat flowing at the rate of 175 bbl. of oil per hour through a ¾-in. choke has been tested by Pan American Petroleum Corp. in Carbon County of South Central Wyoming, 45 miles northwest of here.

Its estimated daily potential of more than 4,000 bbl. per day is one of the largest ever recorded for a well producing from the Sundance (Jurassic) formation. Operator is drilling ahead and plans to test the Tensleep at about 8,500 ft.

The well, 1 Union Pacific-Anschutz, is 6 miles southwest of South Big Medicine Bow field, the nearest production, and 7 miles southeast of Simpson Ridge field.

The Sundance oil flow was from 34 ft. of sand at 6,485-6,519 ft. Good oil saturation also was logged in the 34-ft. interval immediately above this zone from 6,451 ft. There, a drill-stem test filled 6,300 ft. of oil in 70 minutes. Gravity of the oil is 43°.

Geologically, the well is in the eastern portion of the Hannah basin, eastern arm of the Wind River basin. These basins contain such fields as Lost Soldier, Wertz, Mahoney, Rock Creek, East Allen Lake, and Ferris, all with Sundance production.

Big Distillate Well Tested

SHREVEPORT.—Arkansas Louisiana Gas Co. has opened a new gas-condensate pool in the Cotton Valley sand 15 miles east of Monroe in Ouachita Parish.

The wildcat was completed with an open flow of 7,100 M.c.f. of gas daily, with 1,879 bbl. of 53.8°-gravity condensate from perforations at 9,121-24 ft.

Bottom-hole shut-in pressure was 8,140 psi., believed to be the highest ever encountered at that depth in North Louisiana. A drill-stem test in the Travis Peak also encountered gas and distillate production in three zones.

The discovery is on a 6,000-acre block. Nearest production is 6 miles southeast in Cadeville field.

Pipeline briefs

Mississippi River Fuel Corp. has started working on its curtailed 1957 expansion program to raise its capacity by 10,000,000 cu. ft. of gas per day. The company has let contracts to Cape Construction Co., Inc., for 54 miles of 26-in. loop between Perryville, La., and Columbia, Ill. New compressor units totaling 6,300 hp. will be added. The job will be completed November 15.

Mississippi River Fuel had planned to lay 125 miles of 26-in. along its dual 20-22-24-in. system from Louisiana to St. Louis, and raise capacity 50,000,000 cu. ft. per day. The pipe shortage forced a revision of this plan.

Emerald Pipe Line Corp., affiliate of Shamrock Pipe Line Corp., Amarillo, Tex., will build a 120-mile, 6-in. products pipeline from Sunray, Tex., to Tucumcari, N. M., this fall. The line will ship products from the parent Shamrock Oil & Gas Corp. 21,000-bbl. refinery at Sunray. The project, for which contracts have not been awarded, is to be completed by December 1.

Shamrock Oil & Gas Corp. has its new 32-mile, 6-in. crude line ready for operation from wells in Hansford and Ochiltree counties, Texas Panhandle, to Shamrock's main line. The pipeline will transport 10,000 bbl. daily of crude to Shamrock's McKee refinery.

Part of the 350-mile, 4 to 12-in. system of Inland Natural Gas Co., Ltd., is being pressure tested. The line extends from Savona to Nelson, B. C.

A 15-mile section of 12-in. between Kelowna and Oyama was tested with air to 1,056 psi. No air was lost. This provided the first check on quality of Canadian-made steel pipe which is being used. Pipe was supplied by Alberta Phoenix Tube & Pipe Co., Edmonton. Dutton-Williams Brothers, Ltd., is building the line, which will take gas from Westcoast Transmission Co., Ltd.

Continental Pipe Line Co. last weekend completed its 119-mile, 6 and 8-in. products line from Wichita Falls to Grapevine, Tex., 15 miles northeast of Fort Worth. Conoco will move products from its Wichita Falls refinery to a new $320,000 terminal at Grapevine.

W. H. Smith Pipe Line Construction Co. and C. E. Wilson Construction Co. handled the conversion and extension project. Conoco converted a 99-mile crude line, purchased from Gulf Oil Corp., from Wichita Falls to Saginaw. The extension was laid to Grapevine. This market is supplied primarily by Texas Gulf Coast refiners.

Leonard Refineries, Inc., will let contracts this month for a 43-mile, 6-in. products pipeline from Alma to Lansing, Mich., where a 100,000-bbl. terminal will be built. The line will have capacity of 8,000 bbl. daily with one pump station. It can be expanded later.

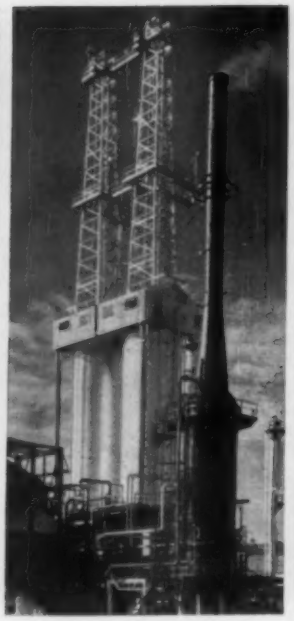
The line will ship products from Leonard's two Alma refineries which have a combined capacity of 21,500 bbl. per day. The project will be completed late this fall. Buckeye Pipe Line Co. plans a 70-mile, 8-in. products line from the Detroit area to Durand to serve this same market (OGJ, May 20, p. 115).

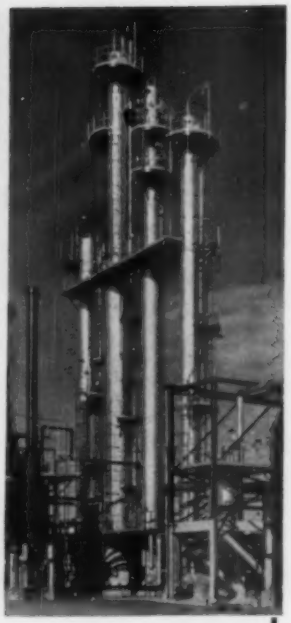
Ohio Fuel Gas Co. has let a contract to H. L. Gentry Construction Co. for 11 miles of 20-in. and 11 miles of 18-in. between Gibsonburg and Toledo. This project will be completed September 20. A 36-mile section of 24-in. in Richland and Seneca counties will be awarded. Completion is scheduled for November 25.

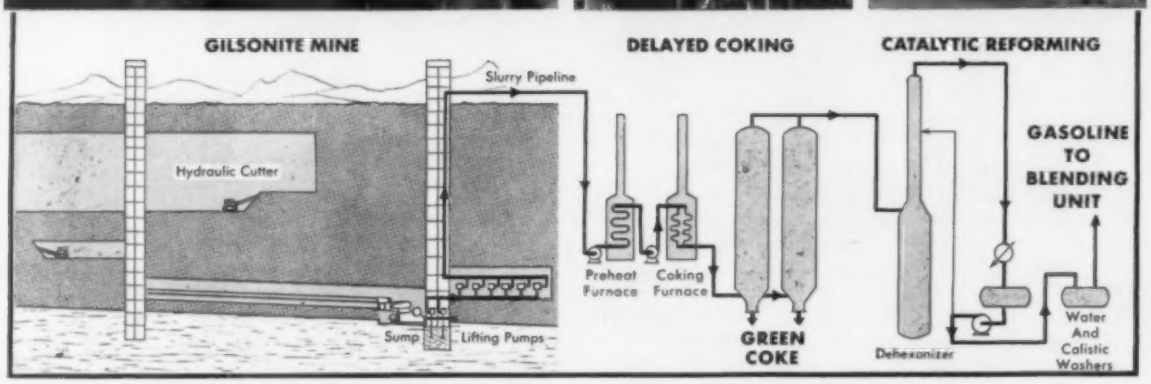
Also for Pipeliners . . .

Oil industry's capital investment hits $70 billion according to Chase Manhattan report (p. 51) . . . Another big gas line to deliver gas to California is planned. El Paso Natural hopes to lay a line from Twin Falls, Idaho, to southwest of Las Vegas, Nev., to move 200,000,000 cu. ft. daily to two southern California utilities. The gas would be Canadian gas out of Pacific Northwest's line (p. 52) . . . Harris bill gets by the rules committee, now goes to the House floor (p. 60) . . . Pipeline expansion is tipoff that Neutral Zone production is rising (p. 63).

PLUS THESE TECHNICAL FEATURES: It pays to supercharge old pipeline engines (p. 77) . . . and Pipeline Patrol's contsruction report (p. 109).







Unique Gilsonite Plant Goes on Stream

GRAND JUNCTION, Colo.—The first plant to economically produce gasoline from a raw material other than crude oil was formally opened here last week by American Gilsonite Co.

From a charging stock of gilsonite brought to the refinery through a 72-mile slurry pipeline, the unique plant is producing high-octane gasoline and high-purity metallurgical coke. About 700 tons of the asphaltite ore is processed daily to obtain 1,300 bbl. of gasoline and 275 tons of coke.

Taking part in the formal opening of the $17,500,000 project were Fred A. Seaton, Secretary of the Interior, and Governors Stephen L. McNichols of Colorado and George D. Clyde of Utah.

American Gilsonite is owned equally by Standard Oil Co. of California and Barber Oil Corp.

E. F. Goodner, American Gilsonite president, said gilsonite laid down melted at the refinery "costs less per barrel than crude oil can be bought in the field anywhere in the United States."

Transporting the ore from the Bonanza, Utah, mine to the $13,000,000 refinery "represents an out-of-pocket cost of about $1 per ton," he said. And since the ore contains about 5.6 bbl. of oil per ton, operating costs for the 72-mile haul are about 18 cents per barrel at present throughput rates.

Goodner pointed out that coke is an important product at this plant "instead of a byproduct as is usually the case. We can sell all we can make at the present time. It yields as much income as gasoline does."

Goodner revealed another aspect of the project. He said the company plans to enter the petrochemical field, but he didn't say what products would be made. However, the ore contains 40 to 60 per cent resin and is rich in nitrogen-base material. As for ammonia, the present 2 or 3 tons being produced at the present charge rate can't profitably be recovered, he said.

What is gilsonite . . . Technically, gilsonite ore is an asphaltite. But it's not an asphalt. It has a high resin content and very little sulfur.

Most accepted explanation is that it was formed from partial decomposition of organic material in shale formations, much in the same way that crude oil was formed. However, massive upheavals of the shale squeezed the material into stress cracks in overlying beds of sandstone.

Principal veins are in the Uintah basin of eastern Utah and western Colorado. Varying in width from a

few inches to 22 ft. along a northwest-southeast strike, outcrops are confined to an area 10 miles wide and 60 miles long.

American Gilsonite has proved reserves of about 16,000,000 tons of the ore. This is about 80 per cent of the total area, and is equal to almost 100,000,000 bbl. of oil. The portion now being developed can supply the new plant for the next 5 years.

How it's mined . . . Gilsonite dust is highly explosive, so the company spent several years developing two radically different methods of "wet" mining.

One method is a form of hydraulic mining. First step is to sink a deep shaft into the gilsonite vein. Tunnels are dug from either side of the shaft.

A jet cutting car makes horizontal hole in the vein. Some types of gilsonite ore contain tiny fractures. In this type of vein, a powerful jet of water with pressure of 2,000 psi. is played on the surface. The stream penetrates the fissures; the ore breaks apart and falls to the tunnel's floor.

Since the tunnels are cut on a rising grade, the water that cut the ore also helps to wash it down to the main shaft to a sump. The large lumps of ore are crushed to less than ¾ in. before entering the sump. The water and crushed gilsonite are pumped from the sump to the surface.

The other mining method uses a long rotary drill armed with carbide-tipped teeth. The drill cuts a large tunnel through the ore. Meanwhile, streams of water pour out through the teeth, keeping the ore wet and washing it down the tunnel.

Process techniques . . . When the crushed ore arrives at the plant, about 65 per cent of the slurry is water. First step is to filter out the water. The solid hydrocarbon then is heated to approximately 450° F., well above its melting point, by means of a hot recycle oil from a delayed coking unit.

Using the delayed coker and a catalytic reformer, the plant converts the solid material into 50 per cent (by weight) green coke, 35 per cent gasoline, and 15 per cent 1,400-B.t.u. gas. The latter is used as plant fuel.

Charge stock to the delayed coker consists of 7,700 bbl. of recycle and 3,850 bbl. of melted gilsonite. The feed is heated to about 910° F. in a direct-fired heater before being discharged to either of two coking drums.

Overhead gas and vapors from the coker pass to a gas-recovery section. Only products coming out of this unit are gas and gasoline. Other products from the fractionating column end up as coker recycle. Bottoms in excess of recycle requirements are burned as fuel oil. A gas-oil side cut is thermally cracked at 985° F. and then recycled to the fractionator.

Gasoline fractions from this unit are charged to a two-stage U.O.P. Platformer. The reforming operation is unusual because it does not produce enough hydrogen to satisfy its own requirements. To make up the hydrogen deficiency caused by the high olefin and nitrogen content of the coker naphtha, additional supplies are produced in a hydrogen plant.

Coke output of the plant is calcined to a product of exceptional chemical purity before being shipped.

Pipelining phase . . . The 6-in. line which carries the gilsonite-water slurry from the Bonanza, Utah, mine to Grand Junction crosses some of the most rugged terrain in the country.

Since this is the first pipeline ever built to transport solid materials over mountainous country, many unusual questions came up during design and construction. Principal problems were the gradient and line velocities necessary to prevent settling, and the best size of solid material to be transported. Corrosion and wear rates also had to be determined in advance.

A 6-month test on a 500-ft. closed loop of pipe at the Colorado School of Mines Research Foundation answered the particle-size question. Although the pumps could handle ¼-in. particles, an eight-mesh size was found to be much better. It lessened particle breakdown in the line, made dewatering easier, and helped to maintain the particles in suspension.

To eliminate the possibility of plugging, the entire line was laid at a reasonably flat slope. However, the 2-mile stretch at Baxter Pass, the highest point, required a 21° slope. Two 300-hp. pumping units at the Bonanza pump station (plus one spare) maintain a flow rate of 350 g.p.m. at a pressure of 2,200 psi. in moving 700 tons of gilsonite daily.

The company took extra precaution to insure against line plugging in case of emergency shutdown. These include a water reservoir on top of 8,500-ft. Baxter Pass, which can flush the line in either direction.

A high-pressure pump at the refinery also can backflush the line. Should a power failure shut down the three electric motor-driven pumps at the Bonanza station, a diesel-driven unit which supplies jet mining water can be used to push water into the line.

The future . . . Goodner said the project "is opening up unlimited possibilities for the vast quantities of petroleum-like materials."

The plant, he says, "proves the economic feasibility of deriving petroleum products from other than conventional sources."

Pembina Gas Plant Gets Nod

CALGARY. — A multimillion-dollar gasoline plant and repressuring system for the giant Pembina field of Alberta is a step closer to reality following a hearing before the Alberta Oil and Gas Conservation Board.

The board indicated approval of a proposal by Harry Bass & Sons, Inc., Dallas, calling for a central plant in the heart of the field, a pipeline network, and a number of compressor stations.

All that stands in the way are a few legal changes, and the final go-ahead from Alberta Premier E. C. Manning and officials of the Department of Mines and Minerals.

Here's what the $17,000,000 project would involve:

. . . 100,000 M.c.f. gasoline plant. The plant would cost $2,000,000. It would turn out about 200,000 gal. of liquid products daily. The output would be divided about evenly among butane, propane, and natural gasoline. Completion target is late 1958 or early 1959. Once the gas is processed, it would be available to Pembina operators to sell or reinject to maintain pressure.

. . . Eight or nine compressor stations.

. . . A pipeline network from wellheads to compressor stations. This would cost about $13,000,000. The network would be the responsibility of the various producers in the field, although the Bass company has offered to arrange construction financing.

. . . Pipelines from compressor stations to the central plant, and a line running to the nearest railroad. This would cost another $2,000,000.

Goliad, Ltd., Bass' Canadian subsidiary, would operate the system and pay for the central plant and the lines from plant to compressor stations and railroad.

More than 30 oil companies operating at Pembina were listed jointly in the application filed with the board. More than 80 per cent of the field's operators have already signed with Goliad.

Quick Writeoff: Magnolia Petroleum Co. can write off one of its $450,000 rigs. Flames destroyed it in about 10 minutes. The fire occurred when the well, a Texas gas discovery, blew out at 12,407 ft. in the Devonian. Gas flowing at a rate of about 75,000,000 cu. ft. was ignited seconds later. The wildcat is about 40 miles northeast of Sanderson and 125 miles south of Midland. It is a partnership operation between Magnolia and Western Natural Gas Co. Myron Kinley, ace Houston firefighter, killed the well after 2½ days by pumping mud into it and shutting off flowing gas.

Harris Bill Up for House Test

WASHINGTON.—The Harris gas bill finally has reached the House floor and may come up for debate and a vote next week.

The controversial measure cleared the House rules committee by a 7-5 vote last week. The committee gave it an open rule which allows amendments to be made on the House floor.

Fate of the bill in the House still is uncertain. Leaders say privately the outcome will be close. Publicly, supporters are more optimistic.

House leaders say they aim to bring up the measure the week of August 11. All plans, however, await completion of a poll of members on how they will vote.

Speaker Sam Rayburn, most powerful man in Washington outside of the President, said if the poll indicates the measure will pass, he'll bring it up. If not, he'll drop the matter.

The speaker explained he feels the measure has a better chance than a similar bill 2 years ago. That bill was approved by a six-vote margin but was vetoed by the President.

The present gas bill has run into tough opposition in early fighting before committees. It sailed through the commerce committee where Rep. Oren Harris of Arkansas is chairman. The fight was made before the rules committee when many House members appeared to testify against the bill.

Usually the rules committee holds hearings for an hour or so. But the Harris bill got the full treatment—6 days and 13 witnesses. The opponents sought to delay action on the bill until next year at least.

Harris reportedly has some compromises ready to offer if the going gets rough on the House floor. One would give the Federal Power Commission control over direct sales of gas. Another would forbid sales at prices below cost.

His idea is that one or more of the compromises might persuade members from coal-producing states to swing over and vote for the bill.

Whatever happens in the House, the bill apparently will not get by the Senate this session. If the House votes down the measure this year, that probably will kill it for good. House delay until next session in considering the bill also would be deadly, leaders say.

Oil Lost to Audrey

Firms ask higher allowables to make up for lost output

BATON ROUGE.—Hurricane Audrey cost Louisiana operators production losses of over 900,000 bbl. of oil.

Five of the ten operators involved told Conservation Commissioner John B. Hussey they want to make up some or all of their losses through increased allowables. The other five were willing to skip their losses, but want increased allowables if they are granted to the others.

Hussey plans to make a decision soon after the companies submit details to him.

Losses and company requests are:

... **The Texas Co.,** 468,000 bbl., wants to make up 318,000.

... **Shell Oil Co.,** 127,000 bbl., wants to make up 106,000.

... **The California Co.,** 83,000 bbl., wants to make it up.

... **Pan American Petroleum Corp.,** 19,680 bbl., wants to make it up if purchasers are available.

... **Pure Oil Co.,** 10,000 bbl., wants to make it up if purchasers are available.

... **Humble Oil & Refining Co.,** 40,000 bbl., wants to make it up only if makeup is granted to others.

... **Union Oil Co.,** 6,000 bbl., wants to make it up only if makeup is granted others.

... **Gulf Oil Corp.,** 120,000 bbl., doesn't want makeup.

... **Sun Oil Co.,** 17,000 bbl., doesn't want makeup.

... **Magnolia Petroleum Co.,** 11,000 bbl., will go either way.

Hudson Sets Sights

Seeks zoning variance for early golf-course drilling

LOS ANGELES.—Hudson Gas & Oil Corp., Shreveport, hopes to start drilling within 4 months on the grounds of the Los Angeles Country Club in West Los Angeles.

The company was high bidder among seven firms seeking rights on the 310-acre lease, which adjoins production on the 20th Century Fox movie lot.

An application is being filed with the city of Los Angeles for a zoning variance to allow drilling at the country club. Public hearings will be held, and approval must be voted by the city council of Los Angeles before operations can start.

Hudson's successful bid on leasing

rights provided for a $150,000 cash bonus, 32 per cent royalty, and a percentage of net profits up to 62¾ per cent.

E. J. Hudson is president of the Hudson firm, which operates about 100 wells in the Mid-Continent area and owns a substantial interest in twice that number. The company also has exploration operations in Italy, France, Switzerland, Cuba, and Canada and has considerable gas processing, sulfur, uranium, refinery, and pipeline interests.

Property of two other country clubs adjoining the 20th Century lot on the south has been leased, and drilling is ready to start. The Hudson lease is on the north of 20th Century.

Penn Grade Dips

First reduction in 3 years knocks 23 cents off prices

BRADFORD, Pa.—The long climb of Pennsylvania Grade crude prices has finally ended. A blanket cut knocked 23 cents a barrel off posted prices.

The change drops Bradford grade in both Bradford Transit Co. and National Transit Co. to $4.65, Middle District in National Transit Co. to $4.47, Pennsylvania Grade in National Transit Co., Southwest Division, to $4.18, Pennsylvania Grade in Eureka Pipe Line Co. to $4.00, Buckeye (Ohio) to $4.00, and Zanesville (Ohio) to $3.04.

The cut was the first change in 6 months. It was laid to high stocks and sufficient to keep supplies up "until sometime next year." It followed 11 straight increases which raised the price of Bradford grade by $1.53.

The last previous cut came September 1, 1954, when Bradford dropped to $3.23, the lowest price since the war. The increase started 3 months later. Here's how they went:

CHANGES IN BRADFORD PRICE

Date—	Price after change
December 1, 1954	$3.35
January 21, 1955	3.50
July 11	3.60
November 1	3.75
December 1	3.85
February 6, 1956	4.00
March 16	4.20
May 16	4.45
July 16	4.57
August 16	4.68
January 21, 1957	4.88
July 26	4.65

Sun Comes Out With Sixth Grade, Says It Is Highest in Nation

JACKSONVILLE, Fla. — Sun Oil Co. has added a sixth grade to its custom blended gasoline and says the new Blue Sunoco "260" is the highest octane motor fuel sold at retail in the United States.

The new fuel was placed on the market last week in Florida and southern Georgia to meet "changing conditions in the Florida market."

The move involves adding two new grades to Sunoco's "200" series and dropping one. The new grades are Blue Sunoco "240" and "260," while the former highest rated grade of "250" was dropped.

Sun is preparing to extend its custom blending system to its entire 21-state marketing territory in the fall.

Sun started marketing multigrade gasolines last year, and the latest change "demonstrates the flexibility of the custom blending system in meeting the needs of motorists as they develop," according to Sun's southeastern regional manager, Max Dietshe.

Anderson Sworn In

New Treasury head is oil man who favors depletion

WASHINGTON.—An oil man who once asked Congress to retain the 27.5 per cent depletion allowance is the new Secretary of the Treasury.

Robert B. Anderson, who came from Vernon, Tex., was sworn in at the White House July 29 as President Eisenhower held the Bible used for the ceremony. Justice Warren Burger of the U. S. Court of Appeals for the District of Columbia administered the oath.

Anderson, who succeeds George M. Humphrey, was formerly Secretary of the Navy and Deputy Secretary of Defense. He left the Government in 1955 to become head of Ventures, Ltd., a world-wide mining firm. He left Ventures May 30.

Anderson was born in Burleson, Tex., June 4, 1910. From 1937 to 1952 he was manager of the W. T. Waggoner estate at Vernon.

He was president of the Mid-Continent Oil and Gas Association from 1948 to 1952, a post which brought him to testify before the House ways and means committee on behalf of the depletion provision.

——Processing briefs

U. S. Oil & Refining Co.'s 10,000-bbl. plant at Tacoma, Wash., is now on stream. A United Transportation Co. barge, carrying 30,000 bbl. of crude from Canada, brought the refinery's first raw material. The barge loaded at the Vancouver, B. C., terminus of Trans Mountain pipeline.

American Petrofina Co. of Texas, the Dallas-based subsidiary of American Petrofina, Inc., will spend $3 million for quality expansion at its Mount Pleasant, Tex., refinery. Biggest items are a 3,000-bbl. catalytic reformer and a 1,400-bbl. alkylation unit.

Canada's first production of synthetic fluid-cracking catalyst is being turned out by Davison Chemical Co., Ltd., at its new $6-million plant at Valleyfield, Quebec. Production is considered sufficient to meet all of Canada's requirement's for the foreseeable future. Davison, a division of W. R. Grace & Co., has similar plants in Lake Charles, La., Baltimore, and Cincinnati.

A new urea plant, with a capacity of 100 tons daily, will be built at Spencer Chemical Co.'s Henderson, Ky., works. Completion is set for next summer. The firm already produces urea at its Vicksburg, Miss., works.

Fluor Corp., Ltd., has the contract for Utah Oil Refining Co.'s 35,000-bbl. crude unit at Salt Lake City. The $2-million unit is scheduled for completion next summer.

Also for Refiners . . .

Eisenhower's imports-control plan is analyzed for its effects on the industry (p. 43) . . . Survey in Oklahoma and Kansas shows replacement costs of crude are greater than its present price (p. 46) . . . Oil's capital investment hits $70 billion (p. 51) . . . Gilsonite plant on stream making gasoline at less than cost of crude processing (p. 58) . . . Penn Grade crude price dips 23 cents (p. 61) . . . Sun comes out with sixth grade (p. 61).

PLUS THESE TECHNICAL FEATURES: Can profits keep pace with octanes? (p. 68) . . . Refinery construction index (p. 87) . . . A new process fights hydrogen blistering (p. 87) . . . On the Job—In the Plants (p. 96) . . . Refiner's Notebook (p. 98) . . . COST-imating (p. 101) . . . The Foreman's Page (p. 103) . . . and PETROdatics (p. 104).

Oil Found in Dhofar

Cities Service-Richfield well tests 2,000 bbl. daily on huge structure in the oil-dry tip of Arabian Peninsula

THE AMERICAN PRESS must be prophetic. Dhofar may be "oil rich" after all.

Cities Service and Richfield have just brought in a 2,000-bbl.-daily wildcat which promises to open a major oil field on the southern tip of the Arabian Peninsula.

Dhofar is a desert area and along with Oman is under the sovereignty of the Sultan of Muscat. The region hit the newspapers recently when a band of nomadic tribesmen in Oman revolted against the sultan. British troops moved in to help the sultan and preserve their role as protector of the Persian Gulf shaikhdoms.

At that time press accounts described the area as oil rich. But there were only dry holes. Now there may be oil.

The jackpot . . . Cities Service drilled four wells in Dhofar before it made a strike last week.

Cities Service holds a 32,000-sq.-mile concession with Richfield, and is operator for the million dollar exploratory effort.

The well that caused the excitement is the Marmul 2. It tested 2,000 bbl. of 22°-gravity crude from 3,200 ft. Crew now is drilling ahead. After this test, Cities Service retested its Marmul 1 and reported it will produce at the same rate. A year ago Cities Service discounted oil shows in the Marmul 1 as of no major significance.

But the two prospective producers now open up possibilities of a major oil field. They are on a structure 11 miles long and 5 miles wide, located 35 miles from sea and 500 miles from nearest production in Saudi Arabia.

A light rig has been used to test the structure. Cities Service said a heavier second rig now will be moved in to test many promising structures already outlined by the company in the big concession.

Cities Service and Richfield got a 25-year concession from Sultan Said Bin Taimaur in 1953. They hold option to renew for another 25 years.

The strike in Dhofar climaxes a program which, up till now, has been full of disappointments. The first test was Dauka 1, abandoned as dry at 11,700 ft. Second try was Marmul 1, 80 miles due east of the first. It encountered an oil sand at 1,900 ft. but its significance was discounted at the time.

Then came Mazraq 1, about 25 miles north, abandoned at 8,500 ft. and Mazraq 2, 2½ miles west of Mazraq 1, abandoned recently at 12,700 ft. as a dry hole.

What about others? . . . The term oil-rich, however, cannot be used to describe other areas at the tip of the Arabian Peninsula—at least for the present.

Millions of dollars have been spent on this region in the past 4 years by three other companies. None has found any oil.

Nearest exploratory effort to the Muscat-Oman trouble spot is the 12,000-ft. well at Jebel Fahud. Petroleum Development (Oman), Ltd., an affiliate of Iraq Petroleum Co., Ltd., abandoned it recently (see map).

The company spudded the well in the almost uninhabited interior of Oman late in 1955 after airlifting much of its equipment to the site. There was no other easy way to reach the surface structure they wanted to drill.

Last reports from that area indicated that the company was planning a second test in the same vicinity when the trouble broke out in Oman.

I.P.C. has a near monopoly on concessions in the lower Persian Gulf region, except for Arabian American Oil Co. in Saudi Arabia; Bahrain Oil Co. in the little island shaikhdom of Bahrain; and Cities Service Co. and Richfield Oil Corp. in Dhofar.

I.P.C. is British-dominated, but a 23.75 per cent interest in its operations is jointly owned by Standard Oil Co. (N. J.) and Socony Mobil Oil Co.

Trucial Coast . . . Along the inner Persian Gulf Coast of the Arabian Peninsula far to the north of the Dhofar region another I.P.C. affiliate, Petroleum Development (Trucial Coast), Ltd., had drilled four dry holes in an effort to find oil south of present productive areas.

Wells at Ras Sadra, Murban, Jebel Ali, and Gezira were all abandoned during the past few years as dry. The company is now drilling a test at Shuweihat.

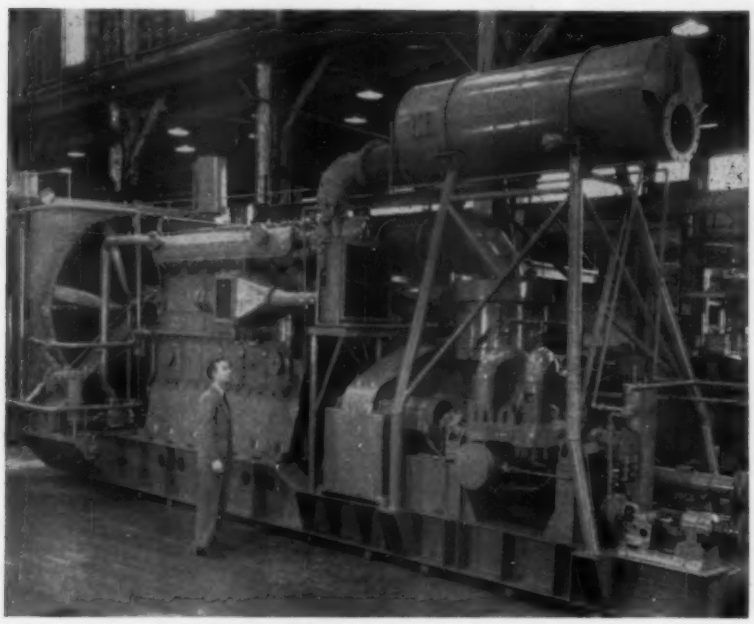
Offshore from the Trucial Coast, Abu Dhabi Marine Areas, Ltd., owned

two-thirds by British Petroleum Co. and one-third by Cie. Francaise des Petrole, plans an overwater test with a drilling platform recently launched in Germany. The operation will cost about $14 million.

Rub Al Khali test . . . Several hundred miles north of the scene of Cities Service's activity in Dhofar, Aramco drilled probably what was its most expensive disappointment in Saudi Arabia.

Aramco went deep into the Rub Al Khali, known as the "empty quarter" in an area that is hardly regarded as a garden spot, to sink the 12,789-ft. dry hole several years ago.

Since that time the American company has confined drilling activities to the areas of its concession farther north and nearer production.



Four huge pumping units like this are tip-off that . . .

Neutral Zone Output Rising

AMERICAN INDEPENDENT OIL CO. is increasing the capacity of its 34-mile Wafra pipeline in the Neutral Zone to handle stepped-up crude production from Wafra field.

This was revealed last week in San Francisco with an announcement that four large diesel-powered pumping units have been shipped to the Middle East.

Aminoil officials revealed that two of the 1,000-hp., 600-r.p.m. power plants are now being installed on the 8 and 10-in. line running from Wafra field to a terminal at Mina Abdulla on the coast. Some 10 miles of the 34-mile line have been looped recently to increase throughput capacity. The new pumping units will replace existing units and add further new capacity.

Two other pumping units now on their way will be used later in plans for additional capacity. Aminoil hasn't decided yet whether to use them as boosters or as units on possible new loops.

Output secret . . . Aminoil declined to reveal exact production figures for Wafra field, where it shares production with Getty Oil Co.

Production at the first of the year was reported at 45,800 bbl. daily with development goals calling for pushing this toward 100,000 bbl. daily by 1958.

Bulk of present production is from the Burgan zone at 3,000 ft. But development drilling is nearly completed in the concession at this depth. Future development is looking toward the deeper Ratawi zone at 6,750 ft. and the shallow Eocene at 1,250 ft. Aminoil has two rigs working in the Neutral Zone and Getty has two.

The pumps . . . Enterprise Engine & Machinery Co. of San Francisco specially designed the pumping units.

Factors considered in the design were temperatures of 130° F., fierce and sudden sand storms, inaccessible sites, and changing production loads.

Enterprise designed lube oil, fuel oil, air-intake intercooling, jacket water cooling, and crude fuel-heating systems which all fit into compact and portable units.

The engines, two of them model DSG-36 and two dual-fuel model DGSG-36, have an economical fuel arrangement. It permits them to burn the crude oil they are pumping and natural gas from the wells. Fuel savings as high as 90 per cent have been obtained from similar operation.

Other features of the engines include intercooling which will permit normal operation under extremely high temperatures; specially designed heads for converting the heavy fuel engines to dual-fuel operations; and removable radiator and its subbase.

Colombia Well Hits

Rank wildcat near Bogota is Intercol's best so far

THE MOST promising wildcat discovery in several years may give a new shot in the arm to oil exploration in Colombia's Upper Magdalena River Valley.

The wildcat, Gualanday 3, tested 840 bbl. daily of 38°-gravity oil through a 5/8-in. choke on a 3-day test.

The hole was bottomed at 7,992 ft. No further details have been divulged by International Petroleum (Colombia), Ltd., which has shut the well in to await storage for more testing.

The discovery is the result of a drilling program started late last year by the Jersey Standard affiliate to evaluate extensive holdings in the upper river valley. The company has been singularly unsuccessful in its efforts to find oil in other areas of Colombia.

The successful test is 75 miles southwest of Bogota and about 15 miles west of Girardot in an area where Intercol has more than 145,000 acres under concession. The well is about 35 miles north of Tetuan field, the nearest production where Texas Petroleum Co. is producing about 1,200 bbl. daily from 17 wells.

It's at least 120 miles upriver from Texpet's far more prolific field at Velasquez where the Texaco affiliate is now producing about 23,000 bbl. daily.

Intercol has more than 3,000,000 acres under concession in Colombia and applications for another 21,000,000 have been pending for months, but the company produces less than 200 bbl. daily. Its fields at Totumal and Buturama in the Lower Magdalena Valley have proved disappointing.

APPARATUS shown here was used for pilot tests of the new process. Fig. 1.

CONVENTIONAL four shots per foot were fractured to give essentially vertical fractures. Fig. 2.

How Fracture Initiation Can Be Controlled

Here's a new idea that may be the answer for controlling the direction of fractures in formations. It's based on parallel holes, correctly sized and spaced, shot into the formation. Results in field tests to date make it a promising new tool.

By Bruce Gilbert, George Neill, and Roscoe Clark
Western Co.

THE WESTERN CO.'S new fracturing process has a single general purpose: Give a high degree of control in starting and extending fractures.

General nature of the new method is discussed on page 54. Here are technical details on its capabilities and limitations based on results obtained with it to date.

Western engineers in devising the new technique sought solutions to two problems which have long vexed researchers in fracturing:

... **How to control fractures** at point of initiation in well bore?

... **How to control the plane** in which the fracture is opened and extended?

Previous studies[1 2 3 4] have shown that for each zone of permeability a single, deep penetrating fracture provides more effective reservoir drainage than several shallow penetrating fractures. These conclusions are being supported every day by field results.

A number of attempts have been made to control fractures. An early attempt was made to create horizontal fractures for use in squeeze cementing operations. This trial consisted of firing four shots spaced 90° apart simultaneously in a single plane. The purpose was to obtain cement in all 360° around the casing to eliminate vertical migration of fluid.

Another attempt[5] was made to create vertical fractures by perforating a formation (through casing) with the shots (4 per foot) arranged linearly along one side of the gun (instead of spaced uniformly around it). These attempts, while certainly a step in the right direction, were unsuccessful.

Pilot and Field-Test Results

Pilot tests of the new process have been conducted and compared with the results obtained with conventional and other methods.

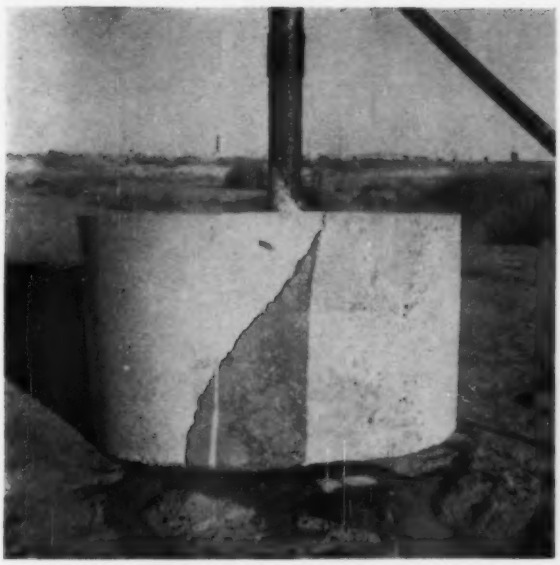
These tests were conducted in the apparatus shown in Fig. 1. The test apparatus consisted of a concrete cylinder 3 ft. high and 5 ft. in diameter through which 5½-in., J-55 casing was cemented. The following procedures were tested:

1. Perforated with conventional four-shots-per-foot gun and fractured hydraulically.
2. Perforated with four jets spaced 90° apart in a horizontal plane and fractured hydraulically.
3. Perforated with eight shots 45° apart in a horizontal plane and fractured hydraulically.
4. Applied the new fracture-initiation process.

The results of these tests are shown in Figs. 2, 3, 4, and 5 respectively.

Fracturing through conventional four shots per foot almost invariably resulted in essentially vertical fractures.

Fracturing through holes made by



FOUR jet holes in same plane, spaced 90° apart in horizontal plane, usually broke vertically. Fig. 3.

EIGHT jet holes in same plane, spaced 45° apart, allowed better fracturing results but no control. Fig. 4.

shooting four jets spaced 90° apart in a single plane produced identical results to those obtained when perforating conventionally. Usually only one hole broke (vertically), but when more than one hole broke they broke individually vertically, and did not connect with each other.

Fracturing through eight jet holes radially spaced 45° apart produced somewhat better results. Control of the fracture plane was never obtained and frequently portions of the fracture produced were in a plane almost 90° to that desired.

The new process . . . Using the new process it was possible to develop horizontal fractures, in practically uniform plane, at will. It also was possible to develop uniform vertical fractures in any desired plane. (That is, north-south fractures, or east-west fractures or whatever desired.) Attempts were also successful in developing 45° angle fractures. Fractures can be obtained at any desired angle.

Fifty-two field tests were conducted in an effort to evaluate the process under downhole conditions. Typical results of these tests are shown in Table 1. Based on all of these tests, the following has been concluded:

1. The fracture-initiation process is effective for use through casing in completions and recompletions in zones where the casing has not been perforated conventionally.

2. An injection rate of 20 bbl. per minute can be performed without excessive pressures through each opening made by the process.

3. Each desired fracture is initiated at a predetermined single point in a well. It is not necessary to expose a complete zone by perforating.

4. The opening through the casing and the subsequent fracture produced are more than adequate to drain one zone of permeability.

5. By following the correct procedure, oil zones quite close to water or to gas zones can be fractured without resulting in high water-oil or high gas-oil ratio wells.

6. Considerable cement thickness can be easily penetrated by the process.

7. Thin zones can be fractured using the process without extending the fracture out of the producing zone (and into an adjacent barren zone).

8. Vertical communication outside the casing can be considerably reduced.

9. Fewer holes, and therefore lower costs, are required to establish adequate communication between the well bore and the producing formation.

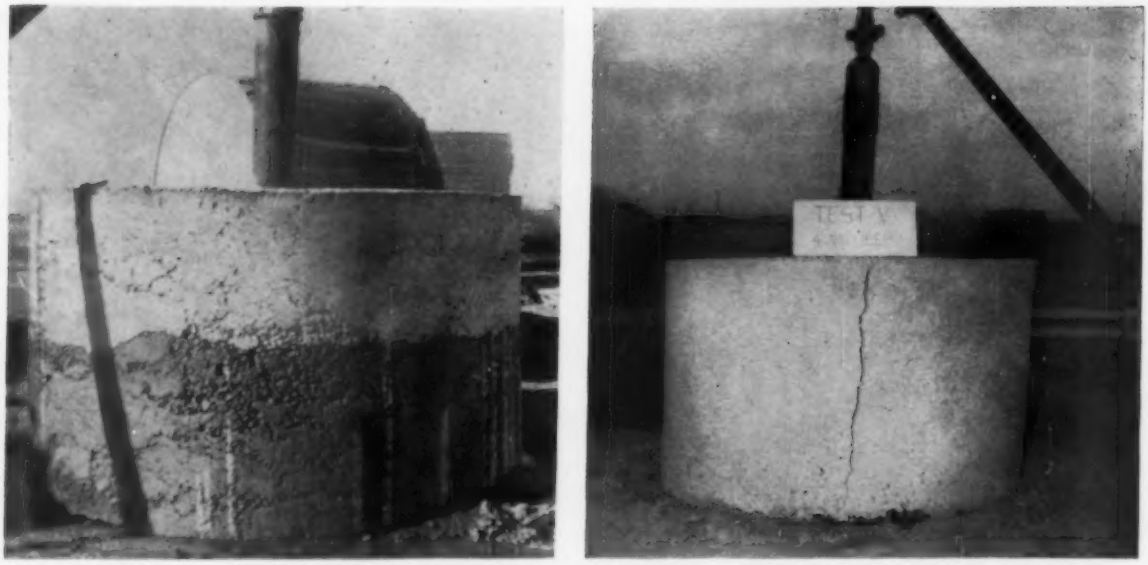
10. The process is approximately 50 per cent effective when used in open-hole sections.

11. The process should not be used

TABLE 1—RESULTS OBTAINED FROM CONTROLLED-FRACTURE-INITIATION FIELD TESTS

Well No.	Formation	Reason for using fracture initiation	Results
1	San Andres Dolomite	Wells typically produce 100 per cent water after fracturing	300 b.o.p.d., 20 per cent water
2	Mississippi Chat	Wildcat. Wells in formation in general area frequently produce large quantities of water after fracturing	10 b.o.p.d., no water
3	Queens Sand	Offsets produce high water percentage and high g.o.r.	402 b.o.p.d., 6 per cent water, g.o.r. 1,466
4	Penrose Sand	Previous well drilled on same location produced high g.o.r. and high water percentage	141 b.o.p.d., 3 per cent water, g.o.r. 821
5	Yates Sand	Selective perforating	Pot. 300 bbl. in 4-hour test
6	Greyburg Dolomite	Offsets allowables penalized by high g.o.r.	Flowing maximum allowable
7	Blinebry Dolomite	Offsets have extremely high g.o.r.	Flowing 440 b.o.p.d., g.o.r. 2960
8	Queens Sand	Offsets produce excessive water with high g.o.r.	Top allowable well with low g.o.r.
9	San Miguel Sand	Very dense formation not commercially productive using conventional treatments	Flowing 41 b.o.p.d. on 8/64-in. choke*

*At 290 psi. tubing pressure, 570 psi. casing pressure.



NEW PROCESS of controlling fracture initiation can produce any fracture direction such as horizontal fracture, left, and 45° fracture, right. Fig. 5.

when the following are exposed: shot holes, previously fractured formations, squeeze cement jobs, conventionally perforated intervals, or heavily acidized sections.

12. An induced fracture can cross intrinsic fractures during its extension.

How the Process Works

1. Initiation of fractures . . . Hydraulically fracturing one perforated hole in a formation constitutes fracturing an infinitely thick-walled cylinder. (For purposes of working in a formation, a thick-walled cylinder has been defined[6] as one whose outside diameter is 10 times or more the inside diameter.)

If two holes are located less than 10 times their diameter apart and then pressured hydraulically to failure, the failure should occur between the holes. Tests have shown that if the holes are parallel to each other, this failure will occur at a much lower pressure than if they are not parallel (radial, for instance).

Tests also have shown that if three parallel holes, properly spaced, are fractured hydraulically, a fracture will occur between each set of holes almost simultaneously. The stress diagram for this condition is illustrated in Fig. 6.

To be practicable for oil-field work the controlled stresses have to be sufficiently intense that fracturing will occur first between the holes before there is failure on some weaker plane. If this can be brought about, then the initiation of the fracture at the location, and in the plane desired, can be accomplished.

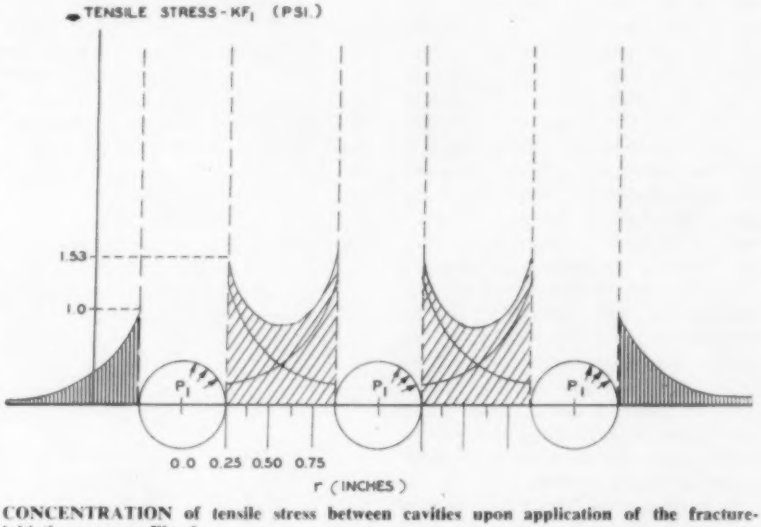
2. Extension of fractures . . . Fig. 7 shows a well bore from which a horizontal fracture has been created. As shown in Fig. 7, the concentration of stress at the extremity of the fracture is almost infinite. Pumping fluids into the fracture, therefore, should continue to exert stress on the extremity of the fracture causing it to continue to split and propagate in the same direction (much as splitting cake of ice using an ice pick to start the crack in the plane desired).

If none of the fracturing fluid leaks off to build up pressure in adjoining or intersecting cracks or crevices, propagation of the fracture in the direction initiated should be expected. If some or all of the fracturing fluid bleeds off into adjoining cracks or fissures, then another fracture may be expected to be opened and propagated in addition to, or instead of, continuing the initiated fracture.

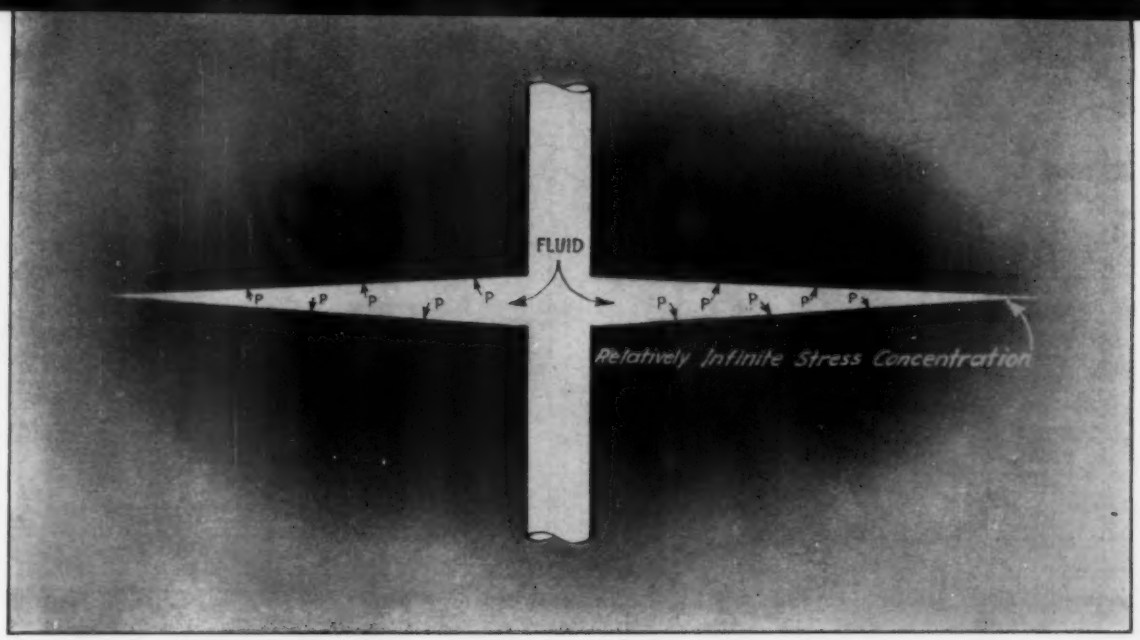
From the above it can be seen that selection of the breakdown and fracturing fluid is important. The fluid must be designed so that it can penetrate the fracture initiated and nothing else. A special breakdown fluid has therefore been designed for this process and is used to accomplish this objective.

Theory

To induce a fracture, the size and spacing of the holes made are critical. A series of tests conducted to evaluate this factor made use of a large number of molded plaster cyl-



CONCENTRATION of tensile stress between cavities upon application of the fracture-initiation process. Fig. 6.



STRESS concentration during fracture propagation. Fig. 7.

inders 12 in. in diameter and 10 in. long. Uniform holes were drilled into the flat end face.

Hydraulic pressure was applied to the cavities using packers manifolded together to maintain equal pressures in all holes. The pressures required to fracture the models and the degree of control of the fractures was measured and correlated with the number of holes, depths of holes, hole diameters, and space between holes.

The fracture pressures varied between 2,000 psi. required to fracture one hole and 600 psi. required to develop a controlled fracture from three holes. Two holes required 1,000 psi. and three holes spaced too widely had a breakdown pressure of 900 psi.

Until the holes were sufficiently close together, random fracturing occurred. That is, the fracture intersecting the holes did not run in the direction of the line of centers of the holes. A high degree of control was achieved using the proper spacing, however.

Obviously the critical hole-size-to-spacing ratio will be different for each type of reservoir rock, for each depth, etc. Exhaustive tests were made in surface outcrops to evaluate this factor as thoroughly as possible before attempting well tests. They were conducted to develop a spacing which would provide the desired results in a great majority of cases.

The process was designed to produce the largest and deepest holes possible in one plane. Adjustment has been made to bring the holes close enough together to produce the stress concentration needed without causing spalling or shattering of the rock material between the holes (thus changing the stress concentration).

Practice

Currently, the stress concentration described in this article is being produced by creating two sets of three holes with optimum hole-diameter-to-spacing ratio. These holes are now created using explosives. Other methods of making the holes are being developed. Fig. 8 shows a picture of the tool now used to initiate horizontal fractures. It is a small tool made of drillable material (which will dissolve in muriatic acid). It is blown into small pieces at the time that the fracture is initiated.

Following (or before) the firing of this device a specially prepared breakdown fluid (usually made from crude oil) is placed across the zone to be fractured. The formation breakdown is then accomplished by injecting fluid into the well until the break occurs and fluid can be pumped into the fracture. The treatment is then conducted in the conventional way. It is desirable (but not always necessary) that the fracturing fluid also be specially treated.

The new concept described in this article is in its infancy. It is difficult now to predict how far or in what direction this method will develop or what form the optimum devices will take. There are many obvious applications, both within and outside the oil industry, where the fracture-initiation process would be of value. Considerable work already has been performed to improve the process and to increase its scope of application. These improvements will be made available to the industry as they are perfected.

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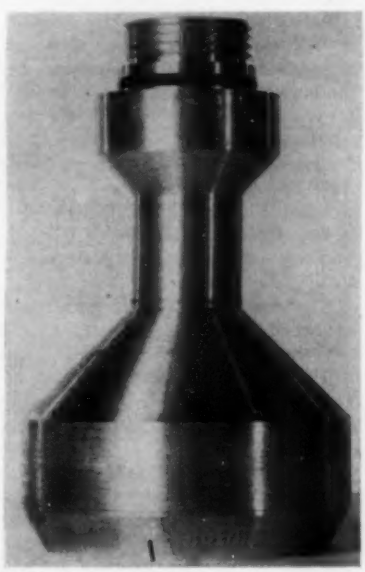
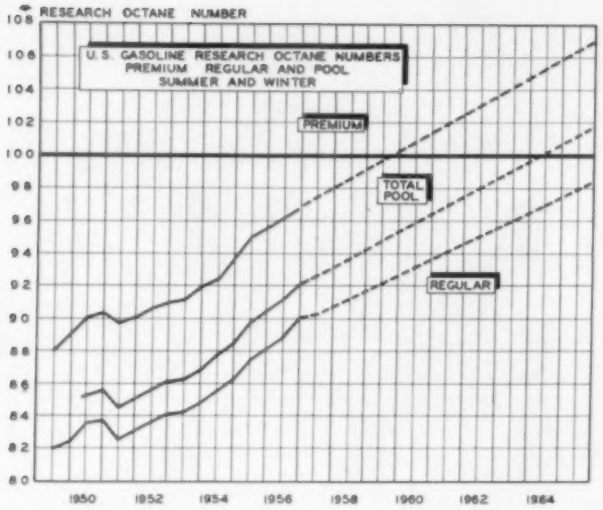
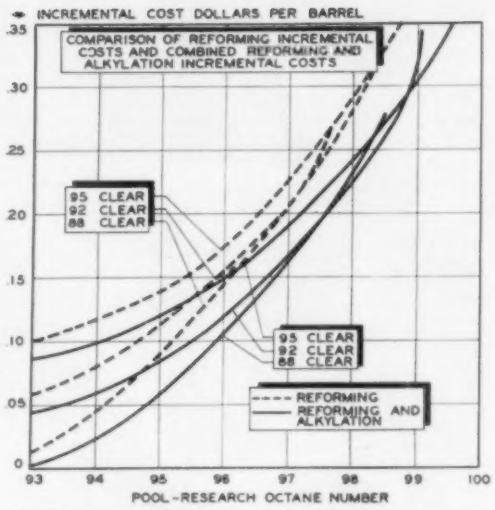


TOOL now used to start horizontal fractures. It is made of drillable material. Fig. 8.



OCTANE NUMBERS have increased steadily since 1949. This increase is expected to continue. Fig. 1.



INCREMENTAL COSTS for reforming and reforming-alkylation operations. Fig. 2.

Do Profits Keep Pace With Octanes?

With pool-gasoline quality still rising, refiners might well be alert to the point of diminishing returns. The author says new equipment will be costly, but anticipated return is good

By S. W. Curry

POOL-GASOLINE quality may be expected to advance rather steadily for the foreseeable future, at a rate approaching the 1.2 research-octane-number advance experienced annually over the past few years.

This means that the refiner who intends to keep up must begin making plans for new or revised processing facilities. The investment will be costly, but the anticipated return is good. And the refiner can expect a fair profit.

As shown in Fig. 1, the total average pool motor gasoline produced and consumed in the United States in 1956 was about 92.2 research octane number. This may be expected to reach 100 by about 1964.

Cost review . . . As a base case for reviewing costs of making high-quality motor fuel, we have assumed a 20,000-bbl. per stream day refinery.

Author is with Universal Oil Products Co., Des Plaines, Ill. Paper presented at W.P.R.A. meeting, San Antonio.

This plant operates on moderately good Illinois basin crude oil of the typical analysis shown in Table 1.

This hypothetical refinery includes all off-battery-limits facilities and these process units: (1) crude distillation, (2) vacuum distillation, (3) fluid catalytic cracking, (4) gas recovery, (5) polymerization, (6) Unifining, and (7) Platforming. This combination of processes will produce a pool gasoline in the quantities and qualities shown in Table 2.

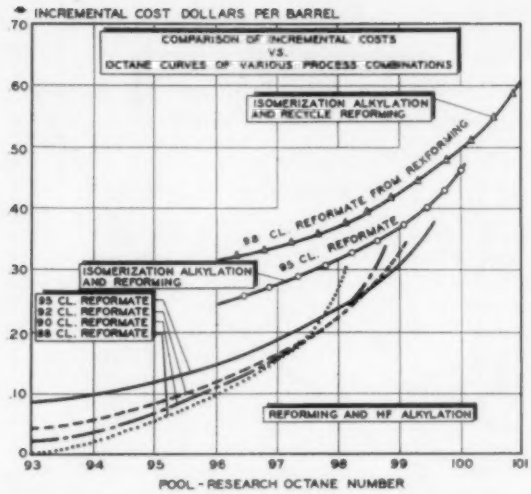
TABLE 1—CRUDE CHARGE ANALYSIS

Gravity, °A.P.I. at 60° F.	36.8
Specific gravity at 60° F.	0.8408
Total sulfur, per cent	0.24
R.v.p., psi.	5.8
100 ml. distillation, type:	
I.b.p., °F.	126
10 per cent	222
30	384
50	558
70	704
90	744
E.p., °F.	760+
Per cent recovered	96.5

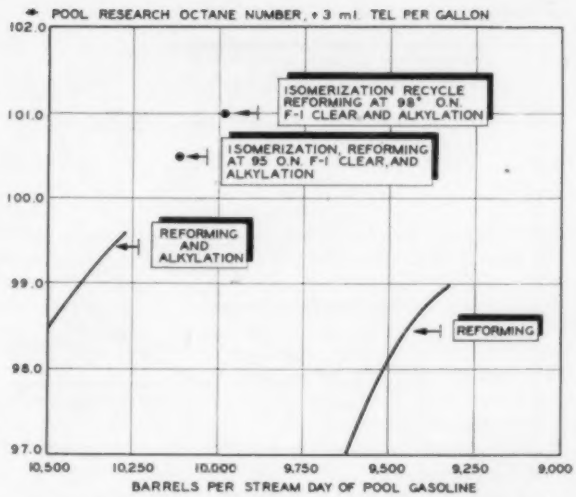
Base gasoline . . . The refinery is capable of producing 93-research-octane-number pool gasoline, with 0.7 ml. TEL per gallon. Total lead cost is 7.4 cents per barrel. Based on today's prices, this gasoline is worth $5.04 per barrel f.o.b. gulf, or, exclusive of lead content, $4.96 per barrel. A pool gasoline of 10-psi. R.v.p. is produced.

The calculations include normal gulf-area costs for utilities, labor, maintenance, taxes, and insurance, and a 10 per cent amortization factor on all incremental capital investments for equipment added as the study progresses.

Alkylation needed . . . When it is desired to increase the pool octane rating from the assumed level of 93 research to 94, by increasing reforming severity alone, we find an in-


INCREMENTAL COST DOLLARS PER BARREL
COMPARISON OF INCREMENTAL COSTS VS. OCTANE CURVES OF VARIOUS PROCESS COMBINATIONS
ISOMERIZATION ALKYLATION AND RECYCLE REFORMING
98 CL. REFORMATE FROM REFORMING
98 CL. REFORMATE
ISOMERIZATION ALKYLATION AND REFORMING
95 CL. REFORMATE
92 CL. REFORMATE
90 CL. REFORMATE
88 CL. REFORMATE
REFORMING AND HF ALKYLATION
POOL-RESEARCH OCTANE NUMBER

INCREMENTAL COSTS for various process combinations, making a given octane. Fig. 3.


POOL RESEARCH OCTANE NUMBER, + 3 ml. TEL PER GALLON
ISOMERIZATION RECYCLE REFORMING AT 98° O.N. F-1 CLEAR AND ALKYLATION
ISOMERIZATION, REFORMING AT 95 O.N. F-1 CLEAR, AND ALKYLATION
REFORMING AND ALKYLATION
REFORMING
BARRELS PER STREAM DAY OF POOL GASOLINE

PROCESS YIELDS at various processing combinations. Fig. 5.

creased cost of 4.6 cents per barrel. However, if we increase reforming severity and also add HF alkylation, the incremental cost of raising the octane rating of the final pool gasoline to 94 research is only 2.3 cents per barrel.

Fig. 2 shows the desirability of combining reformate and alkylate with the other gasoline components, and increasing concentrations of TEL, to obtain pool octane numbers of 94 research and above. In all succeeding cases, alkylation is included in the processing scheme. The quality of the alkylate is assumed to remain constant at 94.0 research octane number, clear.

The economics of adding alkylation are based upon purchasing sufficient outside isobutane, at 9 cents per gallon, to balance the available C_3-C_4 olefins. Normal-butane adjustments to the pool vapor pressure have been included at 5 cents per gallon. Also, any shrinkage from the pool volume of the base case has been included at the previously mentioned value of $4.96 per barrel. Further, any excess production of fuel gas is credited at 12 cents per M.M.B.t.u.

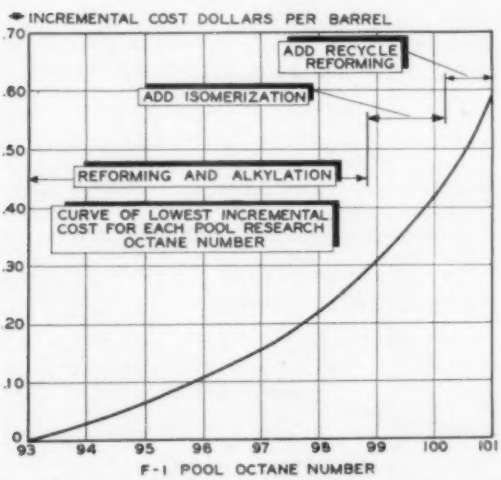
Fig 3 illustrates the cost-versus-octane curves of the various process combinations involved in producing these higher pool octanes.

Of several available choices usable to attain pool octane levels of 95 and 96 research, the most economical procedure in this case is to increase the lead content of the final gasoline. Specifically, the incremental cost of obtaining 95 pool octane number over the base case is 6.0 cents per barrel. Similarly, the cost for 96-octane pool is 9.7 cents per barrel.

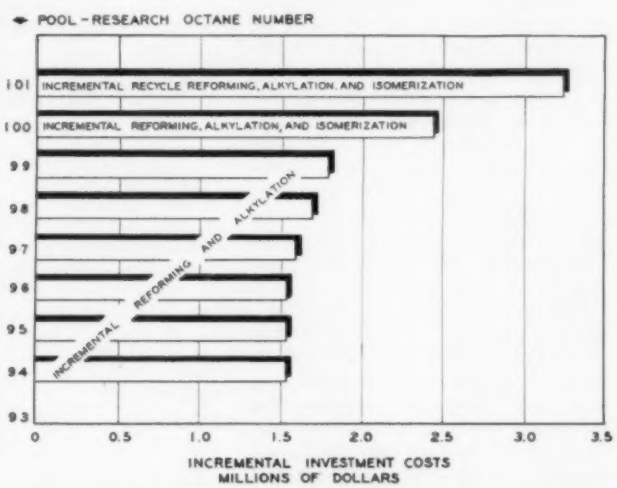
Pool octane ratings higher than 96 research will require the operation of the Platforming unit at progressively increasing severities. To reach 97 octane requires adding reformate testing 90 research, clear, plus alkylate, to the

TABLE 2—BASE CASE GASOLINE POOL

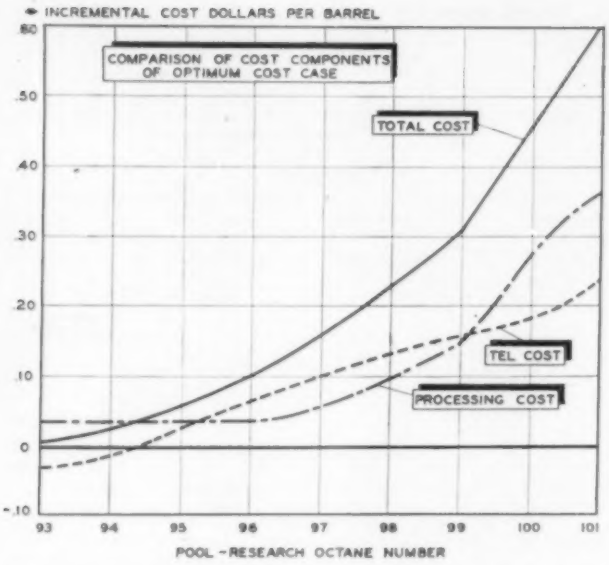
	B/SD	Vol. %	°A.P.I.	R.v.p.	F-1 Cl.	F-1+3 cc.
F.C.C. 425° F. e.p. gasoline	3,670	38.1	56.0	5.0	92.5	99.0
2 lb. polymer	610	6.3	60.5	2.0	96.2	99.8
Lt. S.R. gasoline	1,400	14.5	82.0	18.5	77.0	92.0
Platformate	3,625	37.6	49.5	5.6	85.4	95.8
Butanes	331	3.5	115.0	60.0	100.0	110.0
Total gasoline pool	9,636	100.0	57.9	10.0	88.1	97.2


INCREMENTAL COST DOLLARS PER BARREL
ADD RECYCLE REFORMING
ADD ISOMERIZATION
REFORMING AND ALKYLATION
CURVE OF LOWEST INCREMENTAL COST FOR EACH POOL RESEARCH OCTANE NUMBER
F-1 POOL OCTANE NUMBER

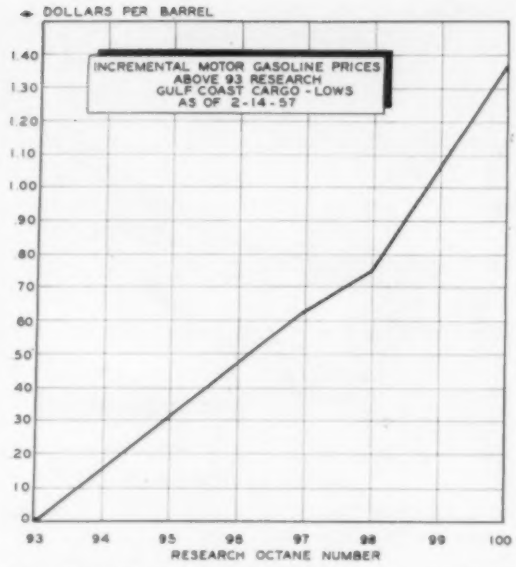
LOWEST INCREMENTAL COSTS for each pool reserve-octane number. Fig. 4.


POOL-RESEARCH OCTANE NUMBER
INCREMENTAL RECYCLE REFORMING, ALKYLATION, AND ISOMERIZATION
INCREMENTAL REFORMING, ALKYLATION, AND ISOMERIZATION
INCREMENTAL REFORMING AND ALKYLATION
INCREMENTAL INVESTMENT COSTS MILLIONS OF DOLLARS

INCREMENTAL INVESTMENT COSTS at various process combinations. Fig. 6.


INCREMENTAL COST DOLLARS PER BARREL
COMPARISON OF COST COMPONENTS OF OPTIMUM COST CASE
TOTAL COST
TEL COST
PROCESSING COST
POOL - RESEARCH OCTANE NUMBER

COST COMPARISONS for components of optimum cost case. Fig. 7.


DOLLARS PER BARREL
INCREMENTAL MOTOR GASOLINE PRICES ABOVE 93 RESEARCH GULF COAST CARGO - LOWS AS OF 2-14-57
RESEARCH OCTANE NUMBER

INCREMENTAL GASOLINE PRICES increase steadily up to 98 octane number and then rise sharply to 100 octane number. Fig. 8.

other pool components. Total incremental cost, including additional TEL, is 15.3 cents per barrel.

A pool octane of 98 research will require reformate testing 92 research, clear, alkylate, and additional lead. The incremental cost over the base case will be 22.4 cents per barrel.

A 95-research-octane-clear reformate, alkylate, and lead will be required to reach a pool octane of 99 research. Incremental cost over the base case is 30.3 cents per barrel.

Isomerization needed . . . Further economic evaluations, not shown, indicate that the least costly route to 100-plus pool octane ratings favor the addition of Penex isomerization of pentanes and hexanes.

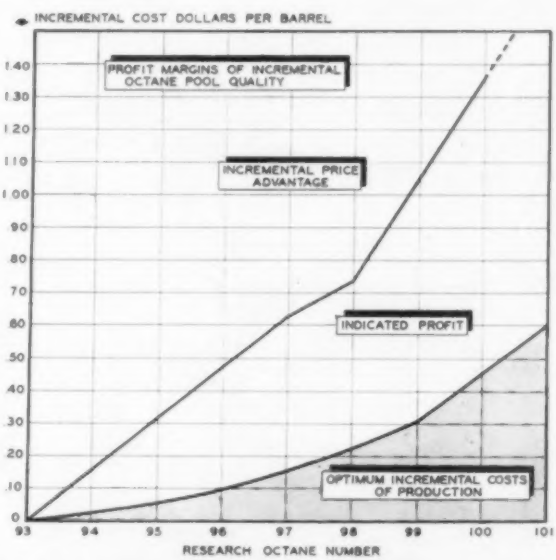
Adding isomerization of the C_5's and C_6's will involve the separation of isopentane from the mixture, isomerizing the normal C_5 plus all the C_6's as a mixture in a single reactor, depentanizing the reactor liquid product, and recycling depentanizer overhead to the deisopentanizer. In effect, pentane isomerization, therefore, is a recycle operation, whereas the hexane isomerization is once-through. The product will be a combined stream.

The octane rating of the C_5-C_6 isomerate will be 79.5 research clear (95.5 leaded). The reformer will be operated to make a 95-research-clear reformate. These, with alkylate and the other gasoline components produced in the refinery, plus TEL, will produce a total pool gasoline rating 100 octane research. The incremental cost over the base case is 45.5 cents per barrel. Without isomerization, a reformate testing 100 research octane clear would have been necessary and the incremental cost over the base case would have exceeded 50 cents per barrel.

101 research gasoline . . . A pool octane rating of 101 research is the highest full octane number readily obtainable under this hypothetical processing scheme. At this level we have reached the anticipated U. S. pool octane required in 1965.

The 101-octane pool gasoline will require all the process units shown for the previous 100-octane case, plus an increase in the severity of the reforming operation to the level of 98+ research, clear. At this reforming severity, charging an Illinois basin naphtha, recycle reforming is indicated as economically preferable to a once-through operation.

We have therefore included Rexforming in this case as a substitute for the Platformer. (In practice the existing unit probably would be converted.) Generally, this would appear to be in order when it becomes necessary to reform to levels in excess of 95 research octane number, clear.


INCREMENTAL COST DOLLARS PER BARREL
PROFIT MARGINS OF INCREMENTAL OCTANE POOL QUALITY
INCREMENTAL PRICE ADVANTAGE
INDICATED PROFIT
OPTIMUM INCREMENTAL COSTS OF PRODUCTION
RESEARCH OCTANE NUMBER

PROFIT MARGINS indicated for increased octane number gasoline. Fig. 9.

This is not an operational consideration but is purely a matter of economics.

Incremental costs . . . Fig. 4 shows the curve of lowest incremental cost for each pool research octane number and the approximate level at which various processes are added to the refining scheme.

The example shown is for a 20,000-bbl. refinery operating on an Illinois basin type of crude oil. Nevertheless the results would apply with slight modification to the majority of crude-oil types and refining schemes. We would particularly emphasize the point that very large refinery throughputs are not required to justify the additional processing equipment necessary to produce superhigh-octane gasoline.

The major components of the 101-octane pool in our hypothetical refinery are reformate testing 98.8 research, clear; alkylate at 94 research, clear; isomerate at 79.5 research, clear; plus the other unfinished gasoline streams as shown in Table 3. The incremental cost over the base case will be 60.2 cents per barrel.

We believe that we have achieved 101 pool octane by the most economical and direct processing scheme using commercially available processes. There are, of course, several other octane-improving techniques which could be utilized—but at the penalty of economic disadvantage for relatively small octane improvement.

Fig. 5 shows the effect upon yields when producing high octane numbers by the various refinery processes. At the present market values for high-quality gasolines, any appreciable volume shrinkage is to be viewed with alarm, as it may very well be the highest cost factor to be encountered in octane-number improvement. Consequently, the employment of alkylation and isomerization processing, in preference to high-severity reforming, is obviously the desirable route from an economic standpoint.

Investment costs . . . So far we have discussed operating costs but have not stated the capital investment involved in adding alkylation, isomerization, and recycle reforming. Fig. 6 shows the estimated incremental capital investment required for process equipment for each additional octane number of the total pool gasoline.

Immediately upon increasing the pool octane number above 93 research, the alkylation unit, costing about $1,550,000, is indicated. It is capable of producing approximately 1,500 bbl. per stream day of 94.0 research octane clear alkylate.

The process-unit investment cost above the 94-octane level is relatively constant up to about 97-octane pool, where it becomes necessary to operate the Platformer at higher severities. The next large investment increase occurs at 100-octane pool, at which time an additional investment of approximately $670,000 is required to install an isomerization unit to process approximately 1,050 bbl. per stream day of pentanes and hexanes.

At 101-octane pool it will be necessary to convert once-through reforming to recycle reforming, at an investment of approximately $1,000,000. The unit will then be capable of producing 100-octane-research clear reformate. As a matter of interest, the total amortization costs for the incremental investment required at the 101 pool octane level, based on a factor of 10 per cent per year, amounts to only 12.2 cents per barrel of finished gasoline.

Our investigation indicates that other routes which might be employed to achieve this final pool octane number, and further steps which might be utilized to provide very small octane number increases, beyond that indicated, become relatively more expensive—particularly with reference to the capital investment required.

Cost components . . . The total incremental manufacturing costs expected in increasing the pool gasoline octane level from 93 to 101 research is shown in Fig. 7 by the solid line. The two major components comprising the solid line are represented by the other two curves. The dashed line indicates the incremental TEL costs, while the dotted line shows incremental processing costs.

". . . using the price advantage shown for 100-research-octane gasoline in published quotations, and subtracting from it the incremental cost of production, we find a net advantage of 91 cents per barrel for producing the 100-octane product."

Based on today's published cargo low prices at the Gulf Coast, there is an exceptionally attractive profit to be gained at the present time from producing this material. Fig. 8 shows the incremental motor-gasoline price advantage for material exceeding 93 research octane number. Shown in dollars per barrel, it indicates that 100-research-octane gasoline is worth $1.365 more at the gulf today than 93-research-octane gasoline.

Profit margin . . . Fig. 9 shows the profit margin available to the refiner based on previous cost calculations, versus the present market price. Again using the price advantage shown for 100-research-octane gasoline in published quotations, and subtracting from it the incremental cost of production, we find a net advantage of 91 cents per barrel for producing the 100-octane product.

Furthermore, we have calculated that our hypothetical refinery will produce about 10,100 bbl. per stream day of 100-octane pool gasoline. By altering his processing scheme to permit the production of 100-octane pool, our refiner could improve his profit position today by approximately $9,200 per stream day, or some $3,200,000 annually. That, quite simply, is how the equipment is paid for—and in just about 12 months.

A further point which should now be considered is the time interval involved between the inception of the idea for, and the completion of, the project based on normal refinery-construction standards. It usually ranges from 18 to 24 months. Effectively, this means we must anticipate our processing problems by at least that range of time.

As you know, it is more economical to operate a refinery at the conditions and throughputs for which its elements were designed instead of suffering the unfavorable cost and processing headaches attendant with operating an inadequate processing scheme under "crash program" circumstances which might be required to meet competition.

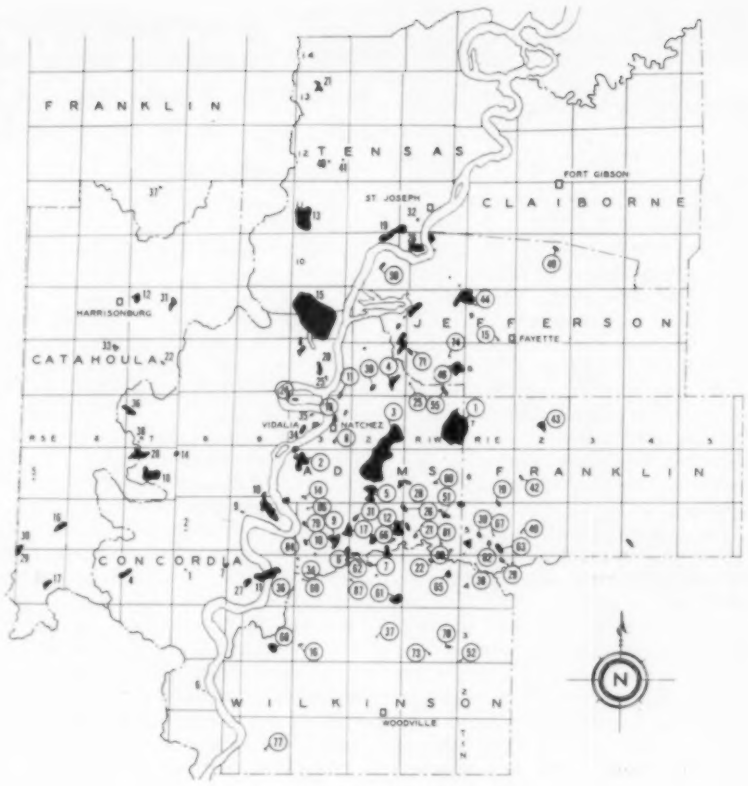
TABLE 3—FINAL 101 OCTANE GASOLINE POOL

	B/SD	Vol. %	°A.P.I.	R.v.p.	F-1 Cl.	F-1+3 cc.
F.C.C. 425° F.e.p. gasoline	3,670	36.8	56.0	5.5	92.5	99.0
Alkylate	1,490	14.9	69.4	2.8	94.0	102.5
Rexformate	3,392	34.0	49.8	9.5	98.8	102.8
Isomerate	1,029	10.3	87.0	11.5	79.5	95.5
Butanes	403	4.0	115.0	60.0	100.0	110.0
Total gasoline pool	9,984	100.0	60.3	10.0	93.8	101.0

PRODUCTION in the Natchez area is from Eocene sands (Wilcox) and the Tuscaloosa (Upper Cretaceous). Tensas and Franklin parishes are in the midst of an intense Tuscaloosa play. Fields are listed below and many are indicated on map, Fig. 1.

LEGEND OF FIELDS
Southwest Mississippi

1. Cranfield
2. Carthage Point
3. LaGrange
4. Pine Ridge
5. S. LaGrange
6. Ellislie
7. Possum Corner
8. Natchez
9. Sibley
10. Glen Aubin
11. North Natchez
12. Kingston
13. Church Hill
14. New Era
15. South Fayette
16. North Lessley
17. Overton
18. Gardens
19. S. White Apple
20. Pellucid Bayou
21. Courtland
22. Ireland
23. Freewoods
24. Cowpen Point
25. Stanton
26. Wayside
27. Moorland
28. Jeanette
29. Locust Hill
30. Vernon
31. North Overton
32. North Kingston
33. Commencement
34. Lake Lucille
35. Woodlands
36. East Fairview
37. Wilkinson
38. Garden City
39. Flat Rock
40. Knoxville Tower
41. Bude
42. Roxie
43. Oldenburg
44. Fayette
45. Rodney
46. Sunnyside
47. Rusoum (abnd.)
48. Idlewilde
49. Anna
50. Buena Vista
51. Levees Creek
52. Saukum
53. Shieldsboro
54. S. Possum Cor.
55. Forrest Home
56. Mandamus
57. W. Locust Hill
58. Brownland
59. N. Church Hill
60. Cooper Hill
61. Darrington
62. Southeast Ellislie
63. N. Freewoods
64. Homewood
65. Kelly Hill
66. S. Kingston
67. N. Knoxville
68. Lake Mary
69. Mills Bayou
70. Mud Creek
71. Oakwood
72. Poplar Grove
73. Soapstone
74. N. Sunnyside
75. Wells Creek
76. Dixie
77. Fort Adams
78. N. Carthage Pt.
79. Butler Lake
80. Beaver Branch
81. Deerfield
82. Knoxville
83. N. Fayette
84. N. Lake Lucille
85. Moss Grove
86. Laurel Hill
87. Doloroso
88. Rodney Island



LEGEND OF FIELDS
East Central Louisiana

1. Bayou Cocodrie
2. N. Bay. Cocodrie
3. S. Bay. Cocodrie
4. Bee Brake
5. Big Bayou
6. Black Hawk
7. Brabston
8. Clayton
9. Deer Park
10. Esperance Point
11. Fairview
12. Harrisonburg
13. Holly Ridge
14. Horseshoe
15. Lake St. John
16. Larto Lake
17. S. Larto Lake
18. Lismore Landing
19. Locust Ridge
20. Milestone Forks
21. Newlight
22. Pool Lake
23. W. Pool Lake
24. Quinn Bayou
25. Rifle Point
26. Rodney Island
27. Roseland
28. Ross Bayou
29. Saline Lake
30. N. Saline Lake
31. Sicily Island
32. St. Joseph
33. Tew Lake
34. Vidalia
35. Waverly Point
36. Wildsville
37. Wisner
38. Normandy
39. Patton Church
40. Lake Formosa

How Pure Geology Works at Natchez

Part 1 of two parts

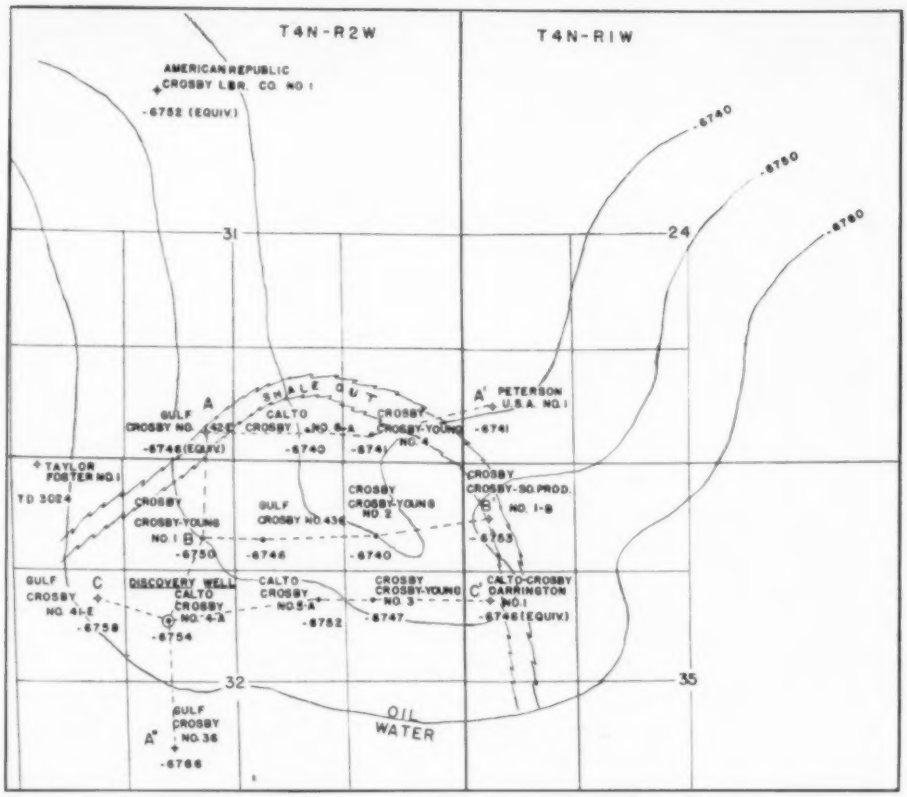
. . . Basic geological application pays off in this area.

By G. W. Gulmon, H. E. Hansen, and B. L. Simms

THE Natchez area of Louisiana and Mississippi points up a fact that applies to the whole country—geologists should use more geology in looking for oil! Isn't it now and hasn't it always been a fact that anticlines or domes are not necessary for oil accumulation? The geologic approach to the discovery of oil is more tedious to some, but the use of pure geology, that has been so long neglected, will yield reserves that will be truly amazing.

The Natchez area continues to be one of the most active and certainly one of the most interesting sections of the country in the search for oil. Many geologic problems are met, and many theories have been made for their solution. The great interest for this area continues because of shallow drilling, quality of the oil, good recovery rates in most sands, and reasonable production costs. It has been shown that many additional small fields will be found than originally believed. Although it appears unlikely that additional large Wilcox pools will be discovered, such as LaGrange, it would not be wise to make that prediction. New prospects are appearing in old areas constantly and

Editor's note: This is the first of a two-part article on the Natchez area. Part 2 will appear in an early issue of the Journal and contain production data on all oil fields in the area.



DARRINGTON is a strat trap. Eocene sands pinch out across a structural nose to form the trap. Fig. 2.

subsurface studies will continue to extend the productive area in all directions.

Although the Tuscaloosa play is just beginning, the opportunities for success seem very good. The drilling is deeper (8,500-9,100 ft.) and therefore more expensive. Recoveries are believed to be considerably less per acre-foot than the Wilcox, but this is offset some by thicker sands. It has been shown at Lake St. John field that recoveries are increased perhaps 100 per cent by a pressure-maintenance program. And it is with this experience in mind that the operators of Locust Ridge field and Rodney Island field are now planning for a unitized pressure-maintenance program.

The Natchez area appeals to small companies and independent operators. Although the major companies have supported the Wilcox play, it appears they are taking a more active interest because of the success of subsurface studies as applied to Wilcox and deeper producing zones.

The Natchez area of southwestern Mississippi and East Central Louisiana has been the subject of two prior progress reports published in The Oil and Gas Journal. The first report[1] dealt with the Eocene Wilcox fields then being developed as a result of oil shows found in drilling deep Upper Cretaceous (Tuscaloosa) tests on geophysical prospects. The second report[2] traced the evolution of subsurface geology as the guide to successful oil exploration in the Wilcox and established modern completion practices as an aid to increased oil recovery.

Today the return to an application of basic geological principles in subsurface mapping, a combination of stratigraphic and structural interpretations applied to exploration problems, and a revival of interest in this phase of geology in general have not only resulted in expanding the area of the Wilcox trend, but also have resulted in the discovery of Tuscaloosa sand oil and gas fields in Tensas and Franklin parishes of Louisiana.

The first phase of oil exploration in the Natchez area and the Mississippi embayment in general was entirely geophysical; success was limited, however, to a relatively few but very prolific Cretaceous age oil and gas discoveries on deep-seated salt dome structures. Phase 2 began after 1944. At that time the emphasis was shifted to use of the subsurface information provided by the drilling of deep tests and development of Eocene Wilcox fields discovered during the drilling of such tests. As more subsurface information became available, geologists of the area began to keep regional subsurface maps on specific contouring horizons within the Wilcox formation and became more and more successful in guiding Wilcox oil exploration. The Natchez area includes Adams, Franklin, Jefferson, and Wilkinson counties in Mississippi and Tensas, Concordia, Catahoula, and Franklin parishes in Louisiana (Fig. 1).

Wilcox

Much has been written about the geology of the Wilcox in Alabama, Mississippi, Louisiana, and Texas. The subject has been treated ably by many authorities. This study is not concerned with the regional aspects of

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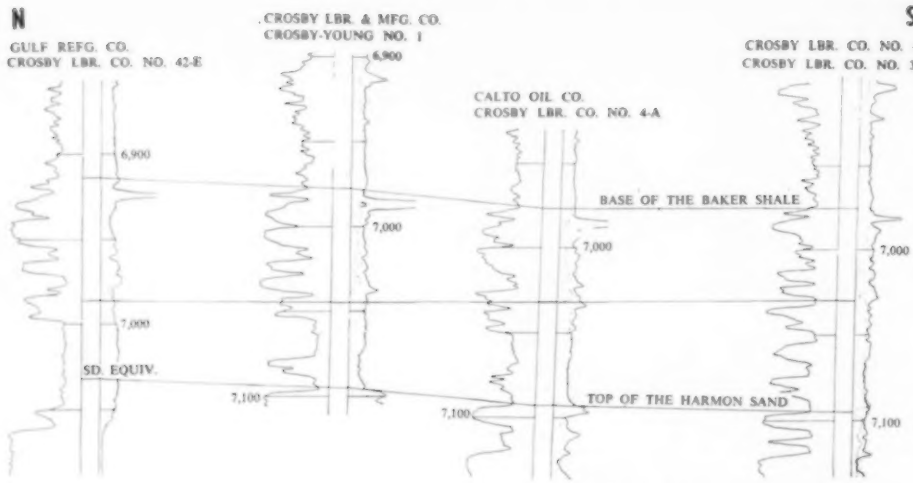


HARMON SAND pinches out updip, grading into a shale section. Discovery well for the field is the Calto Oil Co. 4-A Crosby, second well from the right. (Cross-section A-A'). Fig. 3.

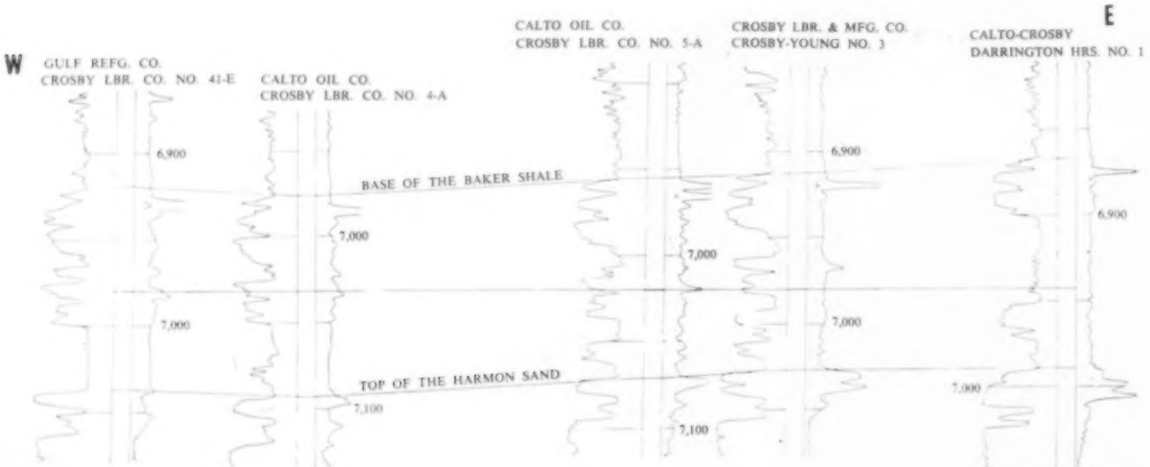
the Wilcox but rather the local area's peculiarities in some detail.

Lithology . . . The section in the subject area (Fig. 1) is from 2,500 to 3,000 ft. thick; it consists of intercalated clays, shales, sands, and lignites. These beds represent a period of vascillating seas caused by an era of unstable shifting of continents, mountain building, surrounding this depositional basin. Shales and clays are brown to dark brown-black in color. Their texture ranges from soft to near-brittle in texture as opposed to the brittle black shale of the Midway section immediately below the Wilcox. The sands in the upper 350 ft. of the section are typically silty, tight, glauconitic, and unconsolidated; these are familiar to many geologists in cores from first Wilcox sand, Stewart A sand, 4,600-ft. sand, and Stewart B in this area. The exception to the above type of sand in the upper 350 ft. is quite rare. In some cases the sand of the 4,600-ft. zone will be clean, porous, and permeable and resemble the deeper oil sands of the Wilcox. The absence of glauconite in these rare cases suggests a deeper water or more truly marine environment for this sand. And where the sand is clean, it usually carries oil (i.e., Sunnyside field, North Natchez field, Northeast LaGrange, etc.).

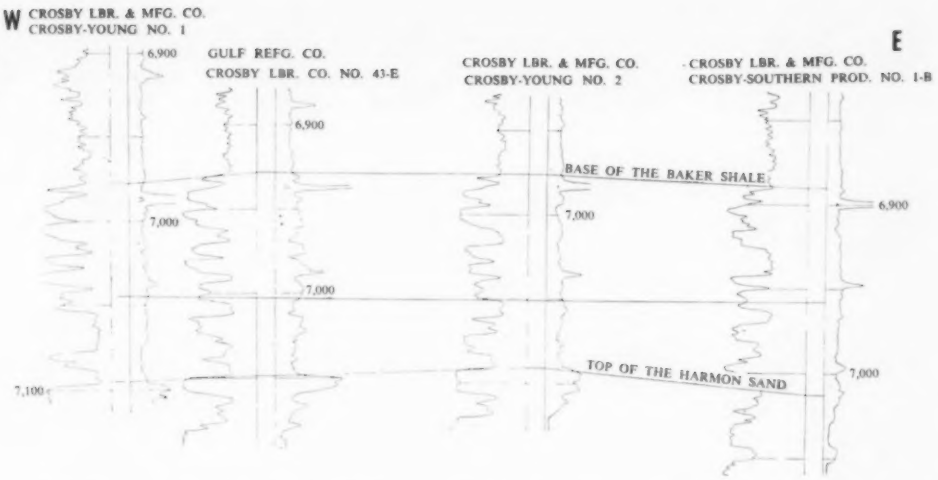
The sands in the rest of the section are quite similar. They vary in color from gray, tan-brown to dark brown; a few (McKittrick) are fossiliferous, some lenses are well-cemented and hard, others loose and friable. The permeability varies but taken as a whole the sands are clean and afford an excellent water drive.

Structure . . . The Wilcox dips gently toward the gulf at the rate of about 80 ft. per mile, as mapped on the Big shale, Baker shale, or Minter sand. There are relatively few closed structures in the Wilcox and three of these, Lake St. John, Cranfill, and Carthage Point, are known deep-seated salt-dome structures producing as well from the Eutaw (Tokyo) and Tuscaloosa sections of Upper Cretaceous age. The only two closed-structure Wilcox fields in the area are Idlewilde field in Jefferson County and South LaGrange field in Adams County, Mississippi. The amount of closure has a maximum of 30 ft.

The dominant structural configuration in the Wilcox is due to the influence of deep-seated domal structures associated with salt domes. These features, with the complementary synclines, account for the regional deviation from normal southeast dip. The structural features of most economic importance are low-relief folds or structural noses with no updip closure that serve as traps for small oil pools. These features are arranged at right angles to the regional strike except where influenced by deep movements, and are located strictly by detailed subsurface studies. The origin of such minor expressions can only be caused by subtle lateral



DARRINGTON is unusual for the area because it has only one producing zone, the Harmon sand. Subsequent drilling may find other producing sands on this nose. (Cross-section C-C'). Fig. 4.



STRUCTURAL nosing is apparent. Notice that the Harmon sand grades into a shale in the well on the extreme right. (Cross-section B-B'). Fig. 5.

compressions in these relatively unconsolidated beds that resulted in faulting or major folding in older, more competent formations.

Though first classified as undifferentiated sediments, certain thick sections of shale were recognized after only a few well logs were available. Subsurface mapping began on the horizon at the base of these shale sections, called the Big shale for obvious reasons and the Baker shale after the fee name of a discovery well in LaGrange field. Later certain sands, such as the Artman sand, were established as valid contouring horizons. The Artman sand has proved to be a reliable structural marker for the area north of the city of Natchez through Adams and Jefferson counties. The base of the Big shale can be carried with relative accuracy through the entire Natchez area of Mississippi and Louisiana. From LaGrange field area south, the most reliable contour horizon is the base of the Baker shale.

To complete their regional mapping picture, some geologists keep a contour map on the top of the Minter sand for the southern one-third of the Natchez area. This was the lowest producing sand in the Wilcox group prior to the discovery of the Kee sand in Lake Mary field in Wilkinson County in 1954. Before this, most Wilcox test wells were stopped just below the Minter sand with approximately 50 ft. more of sediments above the Midway group.

There is some disagreement and confusion on nomenclature of the Wilcox group, but the names used above are those most acceptable to geologists of this area.

Stratigraphic and structural problems . . . There are only a few cases of closed structure in the Wilcox sands. Geologists are usually confronted with perplexing problems of stratigraphy in combination with structural nosings involving less than 50 ft. of relief from regional dip. These problems are not unique in the vast expanse of continued oil exploration. But they are accented in the Eocene Wilcox trend, since they are met in varying degrees in every oil-producing reservoir discovered.

The most aggravating of the problems is the intricate and unpredictable nature of the termination of the updip end of the stratigraphic sand lens or wedge forming the Wilcox oil reservoir. By definition, a small stratigraphic sand lens is of limited areal extent and presents a problem of abrupt or transitional ending in all directions. However, the updip end is naturally of more concern in water-drive reservoirs. When a development well is drilled in a small Wilcox field with two possible producing zones, it is not uncommon to find the expected sands are missing but two or more sands of the same general zone contain oil saturation. This is only the case when favorable structural position is maintained; even then there are zones between sand lens development which are dry in all sands present, regardless of structural position.

The names applied to the termination of oil-reservoir sands vary according to the theory or conception of the geologist working with the problem. A geologist who refers to this occurrence as a shaleout generally conceives of the Wilcox group of sediments as a mass of interfingering sands and shales. In these the sand lenses for the most part are not connected except through short vertical series of sands which may be connected with a more massive sand covering the same general zone at some adjacent point. The massive sand generally would occur at the downdip portion of a structural nosing; it provides something of a common water drive for the various producing sands on the structural nosing.

The term shale barrier and the work of the geologists who prefer the use of this term suggests a conception of the Wilcox as a system of more or less contiguous shales and sand zones. In these there is a traceable shale barrier or zone where the sand has been removed, cutting across low-relief structures to form oil traps over fairly large areas. This shale barrier is attributed to stream deposition or fluviatile action in the deltaic or littoral area of deposition. This concept finds wide acceptance with geologists who prefer to explain a phenomenon in terms of something they see in the same area today in relation to meandering stream action.

Other terms applied to the sand termination problem are facies change and strand line; these two broad areal concepts are altered to apply to changes which may occur within the surface confines of a 40-acre site.

Some geologists working in the Natchez area prefer to relegate stratigraphy to a minor role in their exploration program. Since Wilcox oil reservoirs are generally located on low-relief structural nosings, they concentrate on structural interpretations alone. They contend that shaly sands or absence of sands on high structural positions is a phenomenon as local as the well site and of no consequence in regional exploration.

In an area as complex and intricate as the Wilcox trend, there is plenty of circumstantial evidence in support of nearly all theories.

Darrington field . . . A good example of the stratigraphic problems encountered in development of Wilcox fields is shown in the subsurface structure plat, Fig. 2, and the cross-section studies, Fig. 3 through 5, of Darring-

ton field. This complete study demonstrates the updip termination of the oil-producing zone.

Such studies as these, made from all existing information and kept current as the fields develop, will aid greatly in reducing the rate of failure in field development. With only structural control to guide field development, two additional dry holes might have been drilled on this prospect. Another unique feature of this field is the presence of only one oil sand. Possibly there are additional oil sands on the structural nose, the presence of which must yet be established by the drill. However, the eight wells in the field have produced an average of 21,000 bbl. of oil per month since 1954 and are now producing approximately 22,000 bbl. of 40°-gravity oil per month.

Lignite beds are present throughout the Wilcox, but the greatest concentration (eight separate beds in 200 ft. of section) of well-formed lignite beds is in the LaGrange series of sands immediately below the Baker shale horizon. Here we have the occurrence of clean, friable, fine-grained sands immediately below lignite beds of 1 to 2½ ft. thick. In some cases, such as the Baker sand, there is a lignite bed immediately above and below a clean friable sand. A point of interest and a circumstance that requires more investigation is the behavior of the lignite beds with respect to the shaleout of the producing sand. In many cases, the shaleout can be predicted because the lignite will become thin, that is, go from 3 ft. to a few inches thick in 1,500 ft., then the next updip location will have no lignite at all and, more important, no sand. The development geologist has many problems in the Wilcox of the Natchez area, but the problems are being solved by detailed subsurface studies. The relation of the lignite to oil accumulations when discovered might help solve some of the problems faced by the development geologists of this area. Lignites undoubtedly represent a period of relative stability of the Eocene shore line after rapid transgression of the sea over clean beach and shelf type of sand deposits. This problem is also present in the Cretaceous sands of various sedimentary basins and nearly all areas of thick Eocene age deposits. The relationship of a common ecology of deposition might prove a valuable tool to the stratigrapher.

Ultimate recovery estimates . . . When the first Wilcox oil fields were developed, various core-analysis laboratories were faced with the task of analyzing cores of oil sands which were lightly stained with relatively high-gravity oil and calculating probable recoveries from the reservoir on a per acre-foot basis. The calculations through accepted formulas produced such high estimates of recoverable oil that most analysts weighed their figures with a safety margin, usually by changing the formation volume factor to lower the results and attributing this to shale laminas or silt in the reservoir. As more and more data on individual well production was recorded, the more valid the original recovery estimates became.

Tuscaloosa

Although the Natchez area has been primarily a Wilcox play for the past 10 years, the Wilcox is now being challenged by a new Tuscaloosa play. Paradoxically the Tuscaloosa play is a subsurface-stratigraphic rather than a geophysical type of closed-structure discovery.

It is interesting to note that once again the return to basic geology is paying off in an area where first production was attributed to geophysics. In 1943, Lake St. John field was discovered through geophysical means as was also Holly Ridge field. These two fields are of the closed-structure deep-seated salt-dome type. Although a good deal of exploration has taken place during the 10 years and a good many wells have been drilled, no new oil was found until August 19, 1953, with the completion of Heep Oil Co. 1 Magnolia-Learned, the discovery well of Rodney Island field.[3] From that date to present, five other fields have been discovered: Locust Ridge field,[4] by H. L. Rowley; Wisner field, by Shell Oil Co.; Newlight field, by Chicago Mill & Lumber Co.; Lake Formosa field, by George Jett; and Justina field, by Michel T. Halbouty. It is not known on what information the operators drilled the discovery wells of these fields. But it can be said that in all cases, with the possible exception of Rodney Island, these accumulations are due to updip stratigraphic traps.

The Tuscaloosa dips to the southeast at a rate of approximately 100 ft. per mile. There are many known piercement salt domes in the area, and presumably all have not been discovered. The five fields that have been discovered range over a considerable geographic area and open up a vast area of interest.

The depth will range from 8,000 to 9,100 ft. to the Tuscaloosa pay depending on the position with respect to regional dip. The sand is not highly permeable and some success has been achieved through formation fracturing to increase the volume of fluid. It is too early to tell what this Tuscaloosa play will produce, but at the present it looks like a sizable reserve has been discovered.

There are other areas of the country that have yielded oil as a result of subsurface studies and much more oil will be discovered. The subject area serves as a typical example of what has happened to geologic thinking in the past 15 years. Most geologists have been so busy looking for gravity and seismic highs that they have stepped over oil fields of the stratigraphic type following the more popular techniques. In most cases, geologists have been forced into this stratigraphic study by someone drilling a wildcat and discovering oil. The discoveries, and later development wells, have shown the absence of closure, and the pinchout type of trap comes into its own.

Acknowledgments

The production statistics for the State of Louisiana are furnished through the Louisiana Department of Conservation; production statistics for Mississippi are furnished by the Bulletin of the State Oil and Gas Board. The statistical data were arranged by Mary Clay Palk and Helen Burke Flowers.

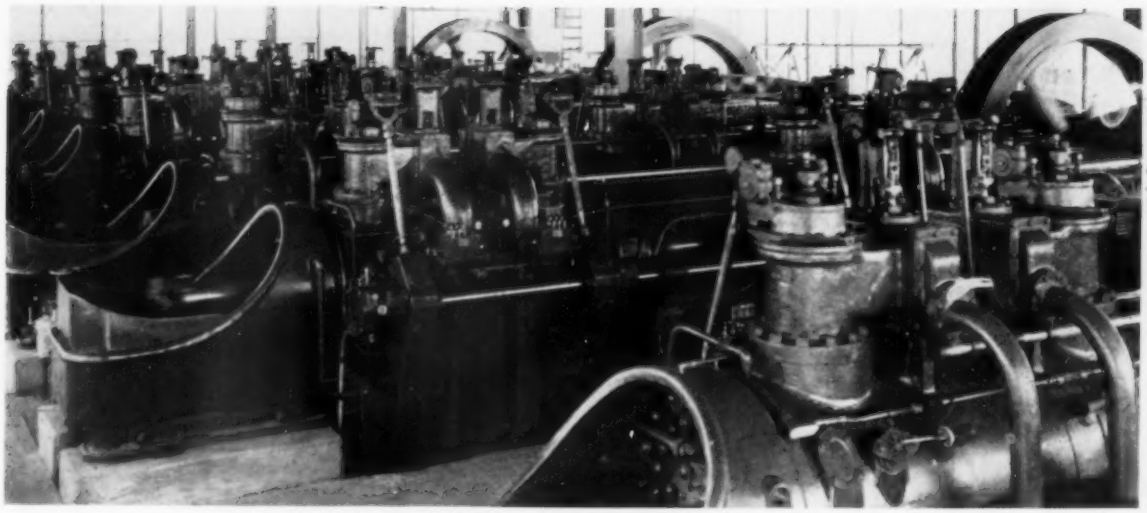
References

1. Gulmon, G. W., and Johns, N. W., "Natchez Area Scene of Active Oil Search," The Oil and Gas Journal, June 21, 1951.

2. Gulmon, G. W., and Hansen, Howard E., "Modern Techniques Boost Natchez Area," The Oil and Gas Journal, April 12, 1954.

3. Heep Oil Corp., Del Cryer and F. P. Dayvault discovered a new lower Tuscaloosa sand oil field at 1 Magnolia-Learned in Township 10n-12e, on Harper's Island in the Rodney Bend of the Mississippi River, extreme eastern, Central Louisiana. Prior to drill-stem testing on this well, electric log was run indicating sand section between 9,237 and 9,272 ft. Well produced from perforations 9,252-60 ft. in Massive sand of lower Tuscaloosa. On initial production gage, it flowed 166 b.o.p.d. through ½-in. choke. There are now 15 wells in this field averaging 39,564 bbl. per month. There are two wells drilling in this field at this time; in one, 5½-in. casing has been set. (Louisiana Rinehart's Oil Report.)

4. Discovery of Locust Ridge field was H. L. Rowley 1 M. D. Adams. Perforated from 9,076-96 ft. in Massive sand of lower Tuscaloosa formation, it flowed 70 bbl. of 58°-gravity condensate and 1,250,000 cu. ft. gas per day through 10/64-in. choke. In addition to producing sand, well was believed capable of production of gas from second lower Tuscaloosa sand topped at 9,026 ft. Southern Natural Gas Co. completed the first oil well in this field, 1 Phillips Watson. Productive from Massive sand Tuscaloosa perforations 9,101-10 ft., it flowed 165 bbl. 39.3°-gravity oil per day through ⅛-in. choke. Now there are 3 gas wells and 22 oil wells producing in this field, on the average of 52,309 bbl. oil per month. (Louisiana Rinehart's Report.)



THIS FIVE-UNIT STATION is powered by Worthington horizontal engines. Fig. 1.

Low investment and operating costs prove that . . .

Supercharging Old Engines Really Pays

It is now generally recognized that the larger loads which a turbocharging system allows to be carried do not necessarily create impossible heat conditions.

By C. S. Kenworthy

THE success with supercharged engines designed by the engine manufacturers has raised the question of supercharging old naturally aspirated engines already installed. The attractions are lower operating costs and lower investment to get added horsepower.

Supercharging has been used many years on four-cycle diesel engines. But the problems in fuel control at varying loads and the heat involved apparently caused designers to shy away from adapting it to gas engines. In more recent years, however, vertical gas engines, both four-cycle and two-cycle, have been supercharged with resultant excellent performance. In fact the naturally aspirated industrial gas engine is already on its way out.

It is now generally recognized that the larger loads which a turbocharging system allows to be carried do not necessarily create impossible heat conditions. The complete scavenging of the clearance space and the resultant low temperature at the beginning of compression make it possible to carry heavy loads with operating temperatures which are entirely satisfactory. This is particularly true if the mixtures are properly maintained.

Author is with Natural Gas Pipeline Co. of America. Paper presented at A.G.A.-P.C.G.A. Transmission Section Conference, May 8-10, 1957, San Francisco.

Restrictions Imposed

In consideration of supercharging the horizontal engines (Fig. 1), it was realized that combustion pressures would necessarily be limited to 400 psi. This maximum-pressure condition was imposed by the manufacturer due to the limitations of the original engine design. Any increas in the normal compression ratio of 5.5 to 1 was out of the question.

There was a big question as to the fuel consumption that might be realized, for the following reasons:

- First, there was no data available to indicate what the effect of the comparatively long exhaust piping system would be.
- Second, the use of a common intake-exhaust cam, which was desirable because of the engine arrangement, placed limitations on the valve timing.
- Third, the low compression ratio made it impossible to approach the efficiency obtained on modern engines.

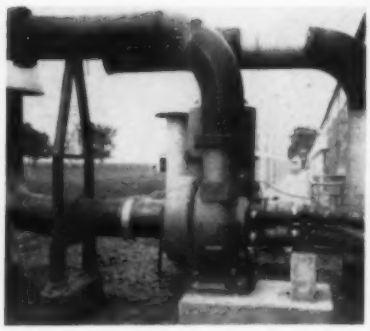
On the compressor end, restrictions are imposed on the size of compressor piston and cylinder that can be used. This is due to excessive stresses that are induced in the main frame.

Advantages to Supercharging

Two possible advantages of supercharging old engines are very apparent:

Low investment . . . The saving in investment as compared to purchase of new equipment is tremendous. Whereas newly installed engine-compressor units normally cost $200 to

L-60 ELLIOTT turbine is viewed from above. Fig. 2.



COOPER turbine and piping are shown here. Fig. 3.

DAMAGE to turbine nozzle ring is pictured. Fig. 4.

$300 per horsepower completely installed, the same horsepower obtained by supercharging is very considerably less.

This is especially true if the compressors can be adapted to the higher unit output and the desired operating conditions. Units installed to date indicate a cost of about $170 per horsepower. And there is no additional cost for land, cottages for employes, or any auxiliary equipment or other additional investment.

Reducer operating costs . . . The savings in operating and maintenance labor and material are self-evident—if one assumes that supercharging can be accomplished without sacrifice in all-around engine performance. The operation of test units has proven this to be a fact.

Supercharging First Horizontal Gas Engine

A study was made in February of 1954 by the Worthington engineering department. It indicated that, by using the Buchi or blowdown system of supercharging and a supercharging pressure of approximately 5 psi., we could expect a 40 per cent increase in the load-carrying ability of the engine.

On May 28, a supercharged unit at our Hooker, Okla., station was operated for the first time for a few minutes on no load. Since that time the remaining four engines at this station have been supercharged. They have operated very satisfactorily at loads exceeding 1,750 as compared to the original rating of 1,250. These units have now accumulated a total of over 90,000 operating hours.

The power cylinder and piston-rod lubrication have been, if anything, better than on our standard horizontal engines. The wear records on the piston rods and cyinders as well as the general condition of the pistons, cylinders and exhaust valves have proved them to be a highly satisfactory unit.

Supercharging Entire Pipeline System

After several months' operation on the units at the Hooker station, it was decided to turbocharge both a horizontal Cooper, and an old Worthington with the exhaust piping on the outside of the power cylinder foundations. On May 17, 1956, one of these Worthington engines was started up as a supercharged unit at our Great Bend, Kans., station, and later, on May 31, a supercharged Cooper engine at our Harper, Iowa, station was put into operation.

The Worthington engine was installed with several improvements over the Hooker units and both this engine and the Cooper engine have been thoroughly tested over the last several months. During this time we have made improvements on each of these units. We are very well satisfied with them and have already started on a program of supercharging all of the remaining 84 engines on the main line of the Natural Gas Pipeline Co. system.

When this program is completed late this year, we will have 91 supercharged horizontal engines in operation. The 48 original engines installed in 1931 have each operated as naturally aspirated units around 160,000 hours. The remainder of the 91 engines installed later have each operated approximately 70,000 hours.

Throughout the entire program, the manufacturers involved cooperated with our own organization 100 per cent. They have my highest regard and appreciation. Our own part of the work required many individuals doing a fine job to accomplish the results.

Lean Mixtures and Proper Scavenging

The importance of operating either, naturally aspirated or supercharged engines with lean mixtures cannot be overstressed. Certain facts are too often overlooked in the design and use of gas engines.

Two mediums in an engine cylinder absorb the heat of combustion. One is the cooling water, and the other is the air passed into or through the cylinder. Lean mixtures mean large quantities of air and resultant low cylinder temperatures. Fortunately, lean mixtures with excess air percentages of 40 to 60 per cent on natuarlly aspirated engines and even more on turbocharged units result in a minimum fuel consumption.

This low fuel consumption still further reduces the temperatures. With constant ignition timing, the fairly rich mixtures up to 5 to 10 per cent excess air result in more rapid combustion than the leaner mixtures. This, together with the fact that theory teaches high combustion pressures result in high efficiency, seems to influence many people into thinking that rich mixtures are desirable.

The fuel which is first ignited may be burned efficiently with the richer mixtures. But the fuel which is burned later in the stroke does not come in contact with sufficient air, and the fuel burns after the piston is well along on the power stroke.

High combustion pressures, which are caused by advancing the ignition, do result, up to a point, in greater efficiency, and also in a cooler operating cylinder.

In the turbocharged engine, the scavenging of the clearance space with comparatively cool scavenging air results in a reduction in temperature at the beginning of compression of around 200° F.

Proper mixtures and thorough scavenging result not only in low fuel consumption but in good lubrication and minimum heat stresses.

Detonation in a cylinder is dependent upon the temperature of the mixture at the end of compression and

Visco Laboratory Reports

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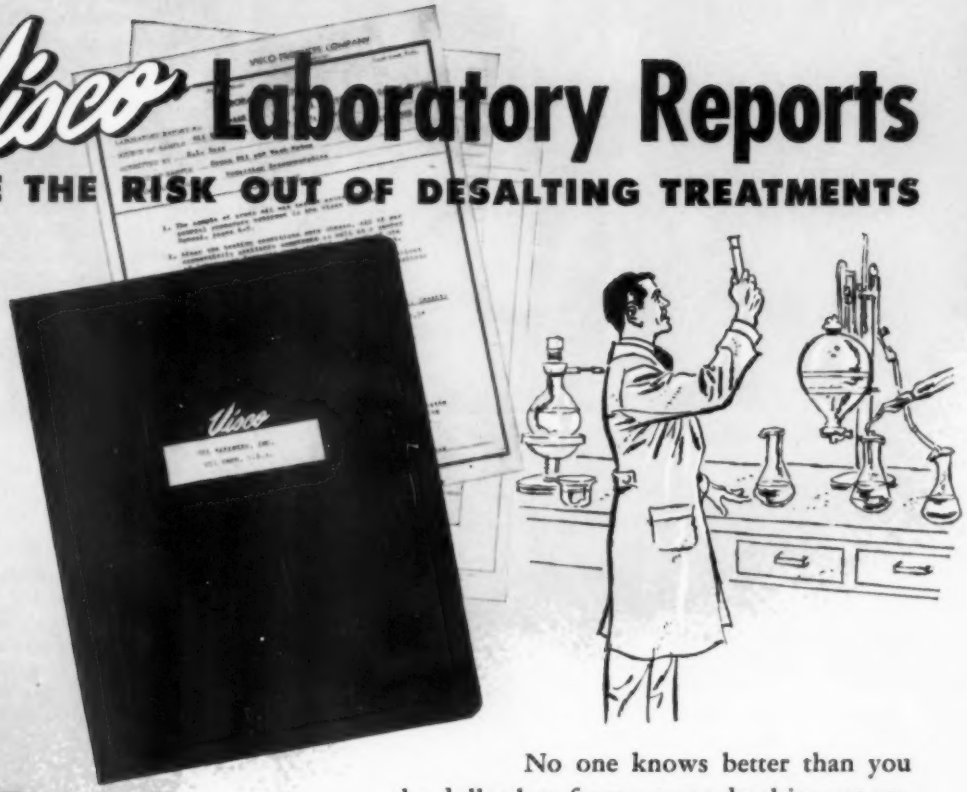

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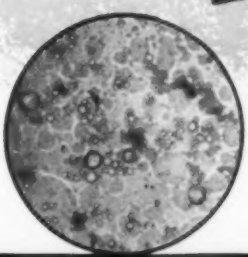
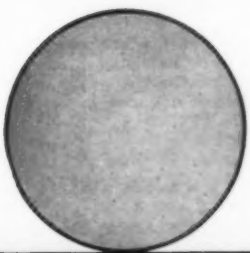


Photomicrograph—
Emulsified refinery crude

In a typical case, 20 or more separate desalting compounds and laboratory formulas may be checked and all contributing factors will be considered before the final desalting recommendation is made.



Photomicrograph—Emulsified refinery crude after Visco desalting

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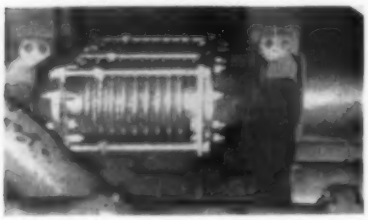
TURBINE oil pump is driven from Cooper engine crankshaft. Fig. 5.



TOP VIEW of exhaust expansion joints on Cooper engine. Fig. 6.

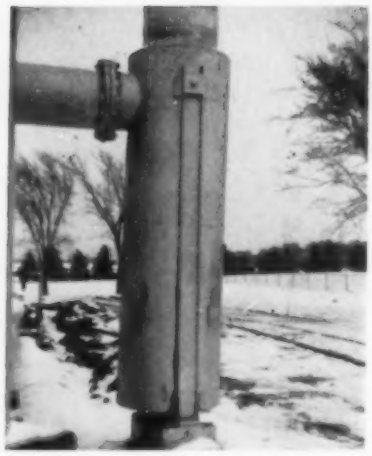
EXHAUST-PIPING insulation and transite cover over expansion joints on Worthington engine. Fig. 7.

during combustion. This problem is eliminated when cylinder temperatures are lowering sufficiently.

Engine and Turbine Details, Test Procedures and Results

Most references will be made to the Worthington unit at Great Bend where most of the more recent testing has been done. Any reference to the Cooper unit will be called to the attention of the reader.

Turbocharger (Figs. 2, 3, and 5) . . . The original turbocharger used on the



EXHAUST muffler and link-type support. Fig. 8.

Worthington engines was an Elliott L-60 pulse type of turbocharger, which allows a maximum of 65 sq. in. nozzle area. Tests were conducted with nozzle rings of various areas. These tests not only indicated the desirability of going to the maximum area, but even indicated that a larger turbine with an even greater nozzle area would result in better operation.

Discussions with the engine and turbine-company representatives led to the design of a larger turbine. Several months ago Elliott Co. proceeded to build this turbine. Tests have been conducted on the Great Bend engine with both turbochargers. The L-984 turbine with an 85-sq.-in. nozzle ring gave the best results.

Figs. 2 and 3 show the Cooper and Elliott turbines together with the adjacent piping. As indicated, an expansion joint was used on the turbine discharge piping on the Worthington. The lubricating-oil pump for the turbine-oil system is driven from the engine camshaft as shown in Fig. 5. The lubricating-oil sump is shown in the lower part of Fig. 2.

Exhaust and intake timing . . . Fig. 13 shows clearly the difference between the exhaust and intake timing on the standard and supercharged engines. To determine the proper overlap to properly scavenge the cylinder, a timed sampling valve was used. This valve was arranged to allow cylinder gases to escape near the end of the expansion stroke to a sampling tube.

Analysis of this escaping gas, using the final valve timing, indicated 8.5 per cent of oxygen in the cylinder. At the same time the oxygen content in the exhaust gas at the muffler was 10 per cent. At this point the scavenging air and exhaust gas are thoroughly mixed.

These data rather definitely proved the presence of air in excess of that actually trapped in the cylinder. Thus, thorough scavenging of the cylinder was guaranteed. In this work it was found to be highly important to use a thoroughly mixed sample of exhaust gas. Samples taken at the exhaust valves indicated a higher O_2 content than when taken at the muffler.

Fig. 15 shows four low-spring, pressure-volume indicator cards taken at full load under various conditions. The study of these types of data, together with the exhaust temperatures, exhaust-gas analyses, and fuel consumptions aided in the final determination of the best valve timing.

Card 1. Atmospheric temperature 98° F.
(Valve timing)
Exhaust opens 74° b.d.c.
Exhaust closes 46° a.d.c.
Inlet opens 66° b.d.c.
Inlet closes 54° a.d.c.

The 112° overlap gave insufficient time for proper scavenging as indicated by the high exhaust temperature. The rise in pressure at the beginning of the intake stroke could be wrongly interpreted to mean a good scavenging condition. However, this pressure occurs when the exhaust valve is practically closed and does not result in moving any gas out of the cylinder.

Card 2. Atmospheric temperature 100° F.
(Valve timing)
Exhaust opens 54° b.d.c.
Exhaust closes 66° a.d.c.
Inlet opens 86° b.d.c.
Inlet closes 34° a.d.c.

To obtain 152° overlap with the cam in use, the exhaust valve must close late and therefore must open late. The result is a high pressure throughout the exhaust stroke. This not only creates a high horsepower loss but also prevents proper scavenging in spite of the large overlap.

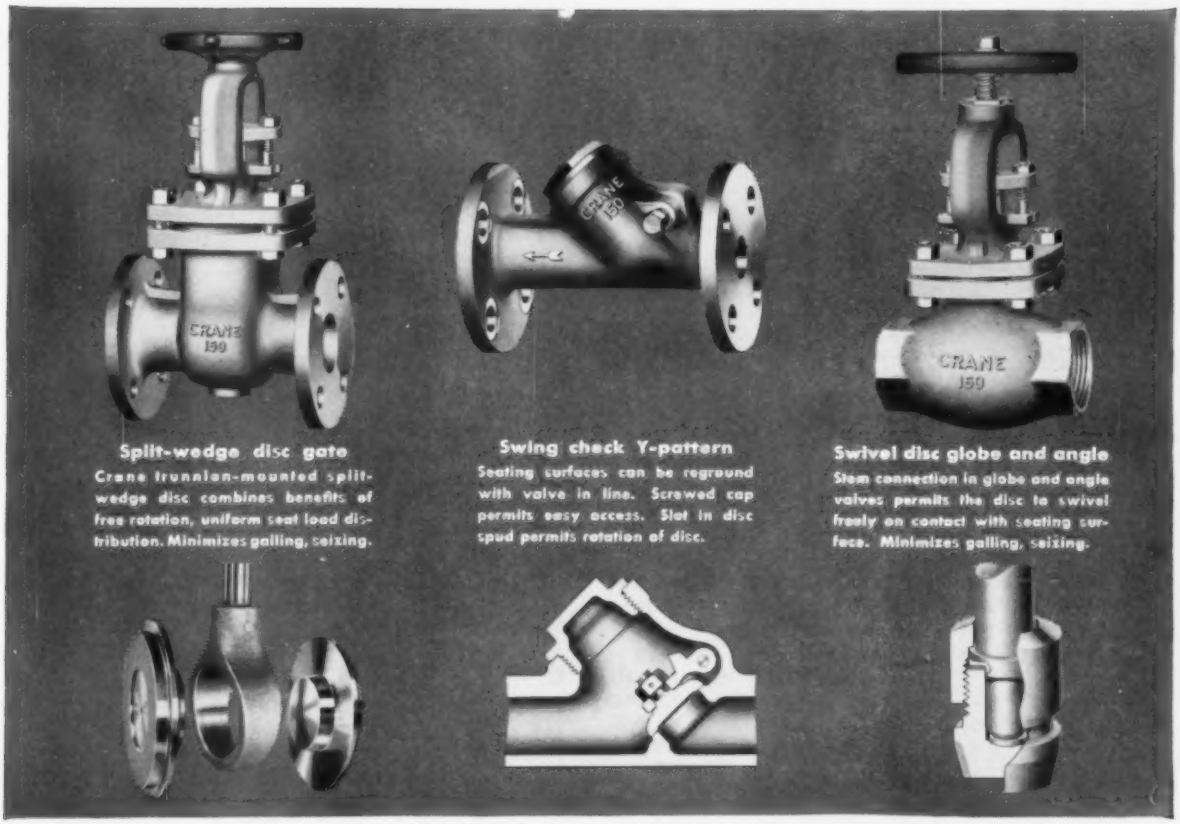
Card 3. Atmospheric temperature 62° F.
(Valve timing)
Exhaust opens 74° b.d.c.
Exhaust closes 46° a.d.c.
Inlet opens 86° b.d.c.
Inlet closes 34° b.d.c.

With the 132° overlap the exhaust valve again opens earlier and closes earlier. This reduces the exhaust back pressure, and in spite of the reduced overlap, results in good scavenging. The card does not show clearly the full benefit obtained, because the inlet control valve was partially closed to maintain the mixture with the reduced atmospheric temperature.

Card. 4. Atmospheric temperature 31° F.
(Valve timing was the same as for Card 3.)

This card shows the very low exhaust pressure which results from the

Cut your piping costs with CRANE corrosion-resistant valves



Split-wedge disc gate
Crane trunnion-mounted split-wedge disc combines benefits of free rotation, uniform seat load distribution. Minimizes galling, seizing.

Swing check Y-pattern
Seating surfaces can be reground with valve in line. Screwed cap permits easy access. Slot in disc spud permits rotation of disc.

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Stem connection in globe and angle valves permits the disc to swivel freely on contact with seating surface. Minimizes galling, seizing.

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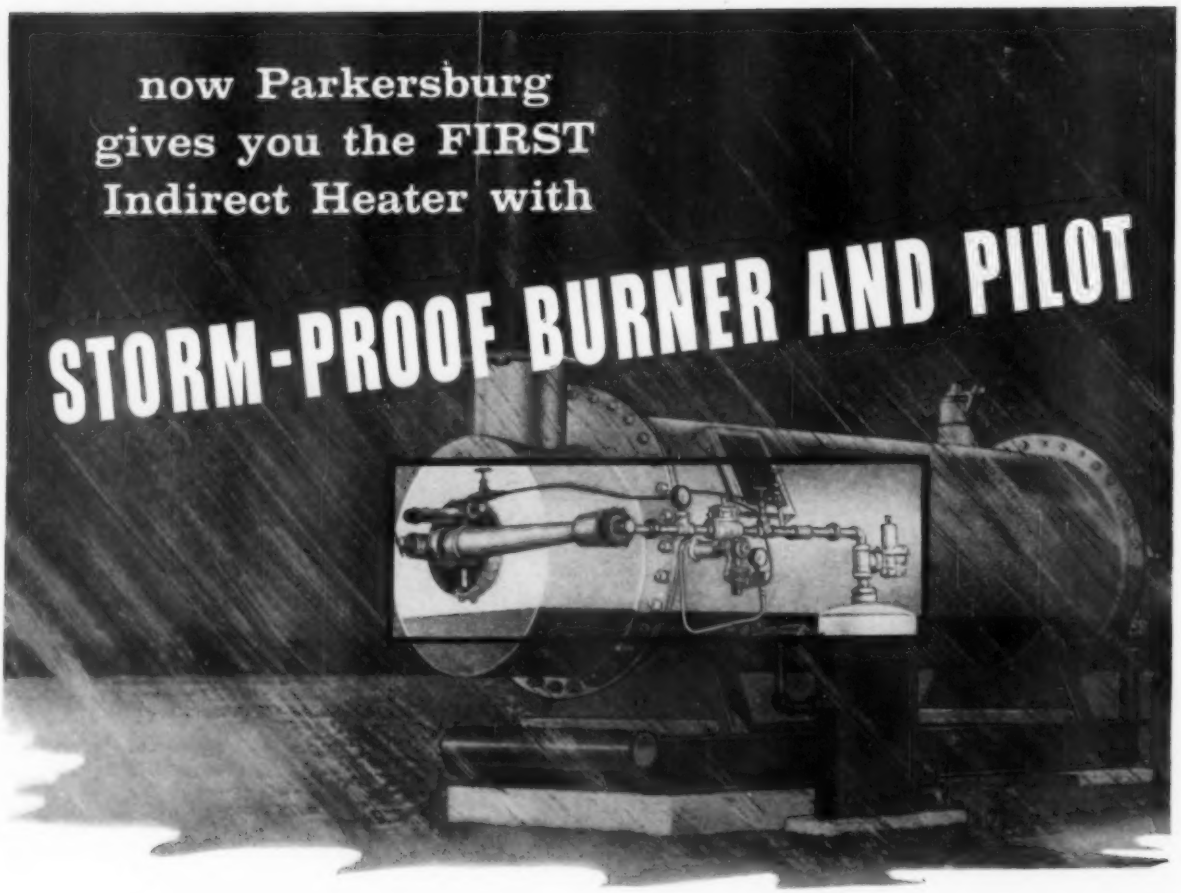

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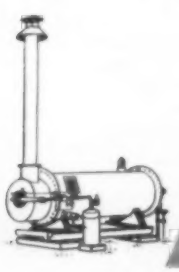

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use of the L-984 with an 85-sq.-in. nozzle ring. The throttling of the inlet control valve due to the lower atmospheric temperature is even more pronounced than in Card 3. The net negative horsepower is low in spite of the throttling.

If the atmospheric temperature were 90° or 100° F., there is little doubt that there would be little or no loss in horsepower on the exhaust and intake strokes. This will be verified this summer when the higher temperatures again prevail. The varying atmospheric temperatures add to the difficulties in obtaining reliable data. However, the tests indicate a reduction in fuel consumption of 4 or 5 per cent by using the larger turbine.

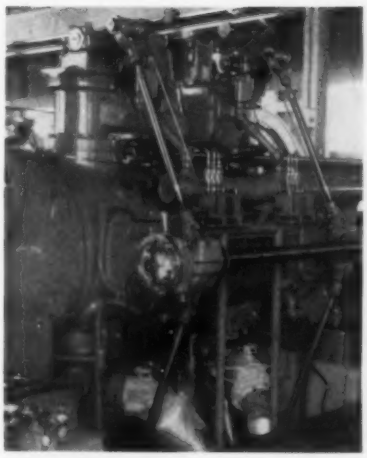
Exhaust-piping arrangement . . . In using a blowdown type of supercharger as compared to constant-pressure type, one of the first things that must be considered is the firing sequence. The horizontal engines have a 90° crank arrangement. With a turbine located in the basement it was logical to connect the two No. 1 cylinder exhaust pipes together, and similarly with the Nos. 2, 3, and 4 cylinders. This was the arrangement used at Hooker.

With the standard camshaft timing, 1 l.h., 1 r.h., 2 l.h., 2 r.h., etc., the 90° spacing allows the high-pressure pulse from a left-hand cylinder to create an excessive back pressure against the right-hand piston. Therefore, with this arrangement, one of the camshafts was rotated 180° to change the 90° spacing to 270° and thus eliminate this condition. This was the case at the Hooker station.

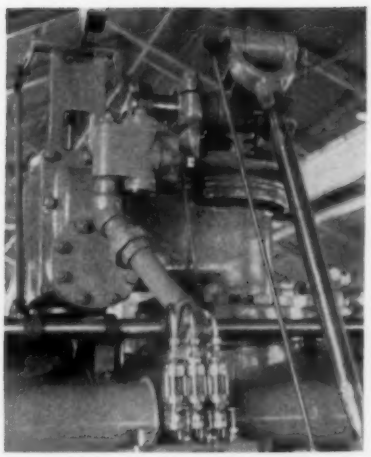
With the newer exhaust-piping arrangement used on the later test engines, with the turbine beyond the building wall, it became logical to connect together the 1 l.h. and 3 l.h. cylinders, and similarly the 2 l.h. and 4 l.h. The same, of course, is true on the other side. With this arrangement the spacing is 360°, and the pulses of one cylinder do not interfere with the scavenging of the other cylinder.

Fig. 14 shows two low spring-scale pressure-time indicator cards taken with an M.I.T. indicator on the latest exhaust piping. The first release of gas which occurs as the exhaust valve opens creates the maximum-pressure pulse near dead center as shown. The higher pressure diagram was taken with the small original turbine and the lower pressures were obtained while using the larger turbine. This reduced back pressure results in a lower back-pressure horsepower.

Any fear that the long lines to the turbine would interfere with proper performance were dispelled as soon as the Great Bend engine was in operation. Comparison of M.I.T. cards with the Hooker installation prove that the difference in exhaust-pressure conditions is negligible. In fact, it seems apparent that these pressure conditions are dependent almost entirely upon the timing of the exhaust valve and the design of the turbocharger, and within reason are not appreciably affected by the length or character of the exhaust piping.



WORTHINGTON power cylinder and fuel gas system are shown. Fig. 9.

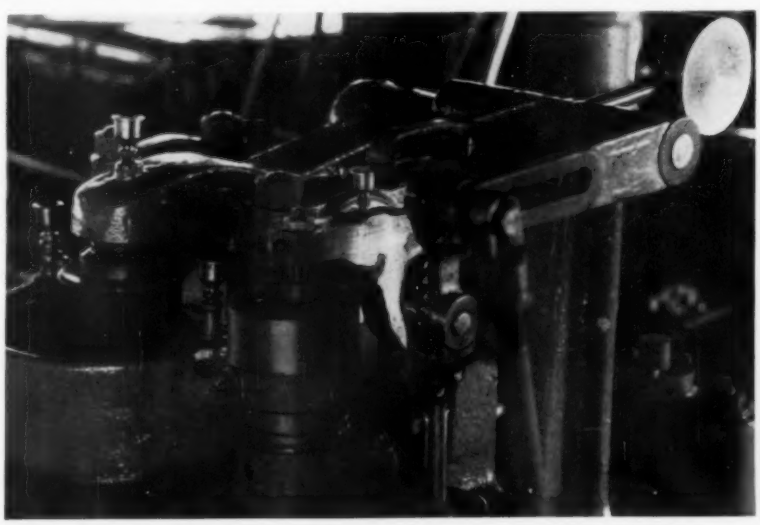


WORTHINGTON gas metering valve with governing linkages. Fig. 10.

Exhaust-piping installation . . . The original 1931 station arrangement does not afford sufficient room in the basement to install a turbine. Therefore, it was decided to extend the exhaust piping outside the basement wall and up to the main engine-room floor. The intention in any final arrangement was to extend the building to contain the turbines in the engine room, where they would be completely accessible.

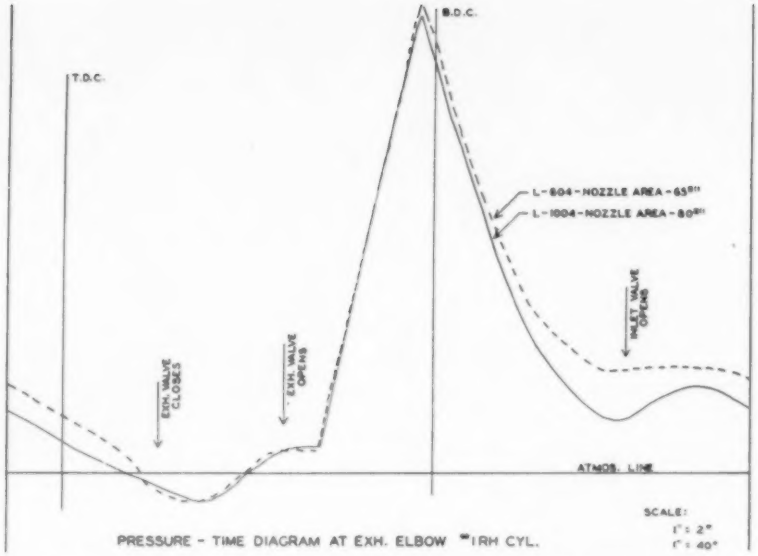
In the final station design, this arrangement is adhered to even in the portions of the building where it would have been possible to locate the turbines in the basement. Their accessibility in this location from a maintenance and operating viewpoint should make the additional expense of the building extension well worthwhile, especially in a territory subject to dirt and snow storms.

An attempt was made to locate the exhaust piping along the outside of each foundation to match the exhaust-valve arrangement. Because of the difficulties experienced in holding the piping in place due to excessive pulsations in the piping bends, it was finally decided to go to a center-exhaust arrangement. On the old engines this required that the exhaust vaives be



CLOSEUP shows Worthington gas-injection valve. Fig. 11.

COOPER inlet valve casing with injection and control valves. Fig. 12.



LOW spring indicator cards on exhaust piping taken on M.I.T. indicator. Fig. 14.

rotated toward the center line of the engine.

The other major problem in connection with the exhaust piping was the expansion joints. Two designs of expansion joints were considered and tried in the exhaust system. A piston and piston-ring type of joint was not entirely satisfactory due to sticking of the rings. In addition, there is always the problem of leakage past the packing or rings.

A corrugated flexible joint was finally used. Considerable vibration occurred in the corrugations caused by the exhaust pulses reacting against the bends in the piping. Some breakage of joints was experienced due to this vibration and also to the fact that they were originally designed with too few corrugations.

It was finally decided to make use of a system in which most of the expansion is taken up in the expansion joint. A set of four bolts mounted in a special flange is used to prevent the joint taking care of the complete expansion.

Fig. 6 shows the final installation on a Cooper engine. With this arrangement, as the engine comes up to operating temperature, the expansion of the exhaust piping forces the one flange of the joint up against the stop bolts of the opposite flange. This results in the piping operating, as far as vibration is concerned, as though the expansion joint were not present.

To insulate these expansion joints a transite housing was incorporated in the exhaust piping supports. The final installation on a Worthington unit is shown in Fig. 7. The piping insulation is brought up to the transite box as the picture indicates.

Turbo aftercooler . . . An aftercooler was installed on both the Worthington and Cooper test engines to determine whether or not it was desirable to use this equipment. The conclusion was that the cooler not only was unnecessary, but somewhat undesirable. Due to mechanical imitations there is no intention to operate the engine at appreciably heavier loads than 1,800 i n d i c a t e d compressor horsepower (i.c.hp.).

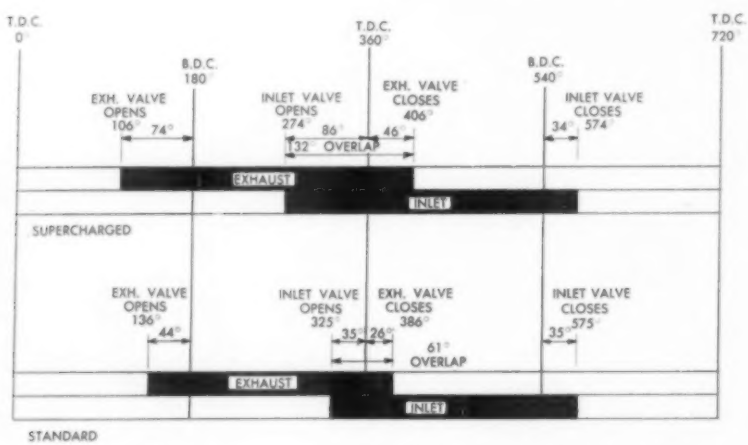
With the blower as finally decided upon, there is sufficient air available to properly scavenge the cylinder and to maintain lean mixtures and low cylinder temperatures up to the maximum load desired. In the hottest weather in the summer the air-control valves at the cylinders run fairly wide open and consequently result in a low back-pressure horsepower.

If the air is cooled, it is necessary for the air valves to throttle the amount of air to the cylinders. This will prevent the mixtures from becoming too lean just as already explained when the atmospheric temperature is low. This results in an increase in back-pressure horsepower, poorer scavenging and poorer fuel consumption.

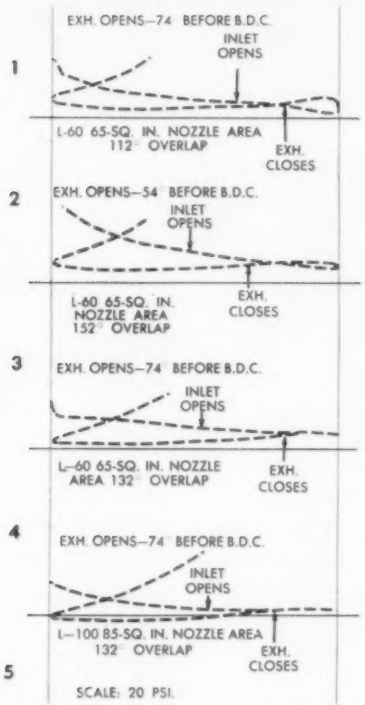
The cooler and its auxiliary equipment represented additional complications and an additional cost per engine of around $3,500. So it was decided to eliminate this equipment from further consideration.

In Fig. 2 the lower part of the cooler is shown at the top of the picture. In the final installations the air discharge piping will turn down into the engine air header.

It is important to note here that the indicated mean effective pressure of approximately 107 is very low as compared to the ratings used on modern four-cycle supercharged engines.



VALVE timing diagrams, shown for four-cycle, 24 by 36-in. horizontal gas engine. Fig. 13.



LOW spring power cylinder cards on supercharged horizontal gas engine. Fig. 15.

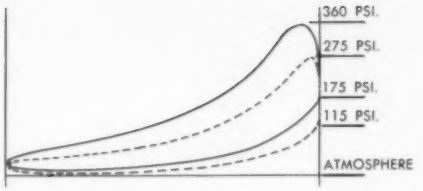
The necessity for aftercooling on these engines, with the higher blower discharge temperatures and much higher M.E.P.'s involved, is easily understood.

Exhaust-muffler support . . . To relieve as much strain from the exhaust piping and turbine as possible, a link type of support as shown in Fig. 8 is being used. At the top end of the links, substantial pins are welded to the muffler. At the bottom end, a similar hinged joint is used. With this type of support, the muffler is completely free to move with the exhaust piping.

Fuel-gas manifold, metering valves . . . Several arrangements of fuel manifold and governor-controlled metering valves were tried. Because of the comparatively long distance between the inlet valves it became necessary to use a rather large manifold to maintain good load balance between the cylinders.

The use of two control valves, one for each side of the engine, was not satisfactory, as the large manifold contained too much gas. The control of the amount of gas admitted to the cylinders lagged the governor movement sufficiently that good governing was impossible.

The final arrangement consists of individual gas control valves for each cylinder located immediately ahead of the corresponding gas-injection valve, as shown in Figs. 9 and 10.



POWER-CYLINDER indicator cards are shown before and after supercharging. Fig. 16.

Injection valve and cam . . . The cam used for injection is merely a lobe on the toe of the inlet-exhaust cam. The normal inlet fulcrum pin has been replaced with a longer pin with a small gas-injection lever mounted on an extension of the pin. This lever is operated by the inlet-valve push rod and is actuated through the entire height of the inlet cam, so it is necessary to use a special injection-valve arrangement which allows gas to be injected only while the inlet roller is in contact with the above-mentioned lobe.

The valve is located in the inlet-valve casing, so that gas is injected through the normal passage originally provided to separate the fuel and inlet air up to the inlet-valve seat. This arrangement prevents any early injection of fuel that might be carried into the exhaust piping during the scavenging part of the cycle.

The Worthington injection valve is shown in Fig. 11. The injection-valve lever is mounted on a newly installed long inlet-valve fulcrum pin.

The Cooper injection-valve arrangement is incorporated in an entirely new inlet-valve casing as shown in Fig. 12.

Governor-control mechanism and ambient-temperature control . . . Several arrangements were tried in regard to the control mechanism. The final arrangement consists simply of moving a correctly shaped gas-control valve a proportionate amount to the air-control valve. The air valve is operated exactly as on all the later-style Worthington engines through a small push rod from a lever on the control shaft.

The new gas-control valve is operated in a similar manner from the same control shaft. The arrangement in Fig. 10 shows the control shaft and the control rods.

The one feature in regard to mixture control, which was possibly the biggest problem, was maintaining the mixtures with variations in the ambient air temperature. As the atmospheric temperature drops, it not only tends to make the mixture lean due to the cooler air, but the increase in blower capacity accentuates this effect. With the mixtures set very lean to obtain low fuel consumption, low combustion pressures and cool cylinder conditions, it becomes highly important to keep the mixtures constant. Otherwise, when the air entering the cylinders becomes too cool, the combustion process slows down and may even cause the cylinders to misfire.

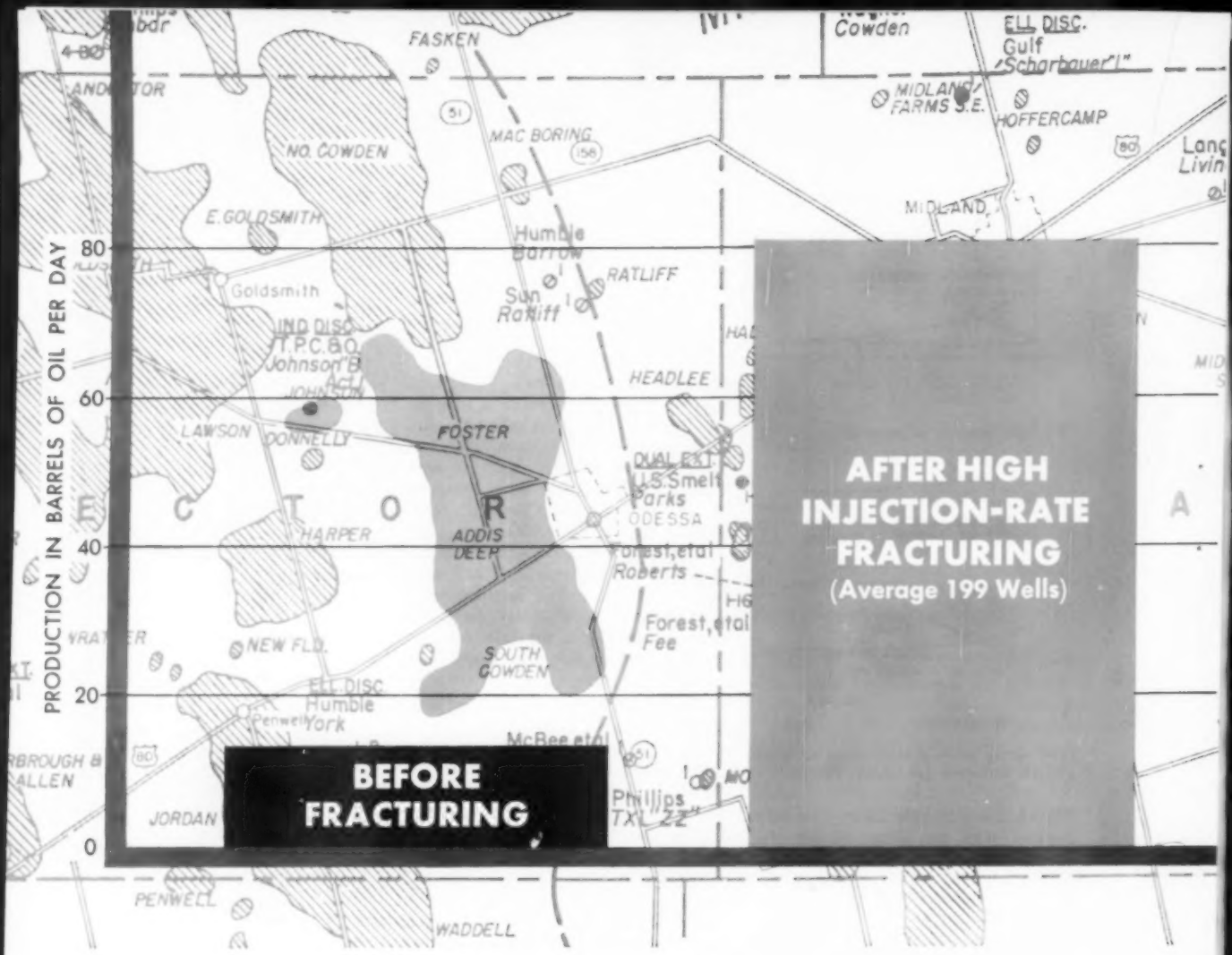
In one attempt to maintain constant mixtures with a variant ambient temperature, the temperature control was tied in directly with the fuel-gas regulation. This did not prove satisfactory, largely because this arrangement took the control of the engine speed away from the governor, resulting in erratic speed control.

The final arrangement consists of a temperature-control mechanism which changes the pressure in the station fuel-gas header. This change is just sufficient to compensate for the change in the amount of air delivered to the cylinders as changes occur in the atmospheric temperature. This allows the governor to remain completely in control of the engine speed.

Governor . . . The governors on the engines installed in 1931 were the original old-style governors which operated the mixing valves through a linkage from the governor head without the use of a servomotor. No attempt has been made to make use of these governors as their operation is too sluggish with the very considerable load imposed on them. They are being replaced with a servomotor type of governor.

The newer engines are already equipped with servomotor type of governors. These governors were designed with so much compensation in the servomotor that it is impossible for the mechanism to move fast enough for any rapid change in conditions. This is particularly evidenced during the starting up and loading of a unit, or whenever there is any tendency for the engine to hunt.

Changes therefore were made in the servomotor which have allowed the governor to act quickly and still be sufficiently stable to operate satisfactorily at all load and speed conditions. This improvement in governor operation became highly important in developing a system of fuel control



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A 523 per cent average increase in production resulted when 199 wells in the Grayburg limestone of West Texas' Johnson-Foster-South Cowden Field were given high-injection-rate fracturing treatments by Dowell. Average well potential jumped from 13 barrels per day to 81 when wells were treated with Sandfrac®, using an average of 20,000 gallons of refined oil and 40,000 pounds of sand per well.

While the relatively large amounts of oil and sand used in the treatments were important, the operators who made this study generally agreed that the high average injection rate of 32 barrels per minute was the most important single factor. On some wells, injection rates averaged 63 bpm.

Many of these wells were old and had been given a variety of earlier treatments, including shooting and acidizing.

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for a wide range of operating conditions.

Ignition . . . A battery-ignition system is being used on both the Worthington and Cooper engines. Some of the early tests on the Worthington engines indicated the necessity of better ignition in order to obtain regular combustion. However, since improving the governor operation and the fuel-injection system the combusion is quite regular.

Using an adjustable ball type of spark gap, the high-tension voltages are found to vary several thousand volts. In spite of the good general engine performance finally obtained, this large variation in voltage is not considered satisfactory. Therefore, investigation of the ignition systems is continuing in an effort to obtain a more constant voltage and spark.

Compressor Changes

The compressor part of the problem in any supercharging program may be a very simple one. Or it can be rather complicated and expensive depending upon the conditions.

At Hooker, replacement of 12⅝-in. cast-iron liners with 14-in. combination steel and cast-iron liners, and replacement of the compressor pistons with the new pistons and rods was all that was necessary.

On the main line, where the suction pressures are higher, the cylinder size required for loading the engines was 15¾ in. Although the original steel cylinder heads were used on both Worthington and Cooper, the valves were replaced with double-deck valves to hold the velocities down.

On the Worthington units new cylinders were used, as the cost of relining and remachining the old cylinders amounted to almost as much as the cost of new cylinders. The Cooper cylinders, however, were sufficiently large to take a normal liner. Special unloader valves were added to all units.

It is planned to install closed cooling systems at all locations over the next 2 or 3 years. An arrangement for closing in the piston-water service outlets similar to that developed by other pipelines will be installed on all of the engines as this work is done.

In spite of all that is done to prevent it, some difficulties no doubt will arise in putting the supercharging program into operation, just as there is with anything new. One accident that has occurred is worth mentioning. A piece of 1½-in. pipe union was left in the exhaust piping and when the engine was operated it entered the turbine causing the damage shown in Fig. 4.

Conclusions

The final results obtained have substantiated the installation of supercharging on these old engines.

By limiting the maximum combustion pressures to 400 psi. the engine is not stressed too high mechanically. The heat conditions are apparently no worse than on the standard engine. Typical indicator cards before and after supercharging are shown in Fig. 16.

The reduction in fuel consumption from 10 down to 8.8. cu. ft. per indicated compressor horsepower-hour may not impress one at first thought. However, the following will demonstrate the value of these results.

The total original horsepower of units involved is 107,500. The total increased horsepower will be 43,000.

Assuming a fuel consumption after supercharging of 9 cu. ft. per i.c.hp.-hr. the total fuel consumed per day will be 32,508,000 cu. ft.

Instead of supercharging the present units it would be possible to obtain the increased horsepower by installing 43,000 i.c.hp. of the most modern high-compression units. In this case, the old engines would continue to operate with 10 cu. ft. per i.c.hp.-hr. using a total of 25,800,000 cu. ft. per day.

Assuming a fuel consumption of 6,200 net B.t.u. per brake horsepower, the fuel used on the new units would be 7,120,000 cu. ft. per day, making a total for the entire 150,500 hp. of 32,920,000 cu. ft. In arriving at the above figure, a 92-per cent mechanical efficiency for the compressor was assumed. The net heating value of the fuel in actual use is 980 B.t.u.'s per cubic foot. The installation of new engines actually suffers slightly by this comparison.

With the advantages in investment and operating costs, the turbocharging of these units would seem to be a good investment. **End.**

New Process Combats Hydrogen Blistering

SHELL Development Co. has announced that a patented process to prevent hydrogen blistering of steel refinery equipment has been made available to industry through a royalty-free license.

Shell said the grant has been made in consideration of the splendid assistance received from other branches of industry and as a contribution to industrial activity.

It appears that blistering occurs when hydrogen sulfide reacts with steel, forming atomic hydrogen which then penetrates the steel, collects in laminations and slag inclusions, and combines to form molecular hydrogen. This molecular hydrogen accumulates there developing sufficient internal gas pressure to crack and blister the steel.

Shell's process, U. S. Patent 2780-583, inhibits the penetration of hydrogen into steel and thus prevents blistering. The patented process calls for the injection of small amounts of air into processing equipment, where conditions are conducive to hydrogen attack. Ammonia is added to maintain proper alkalinity.

Hydrogen damage to steel has been substantially eliminated by the use of Shell's air-injection process. The process is used in refineries operated by Shell and other companies.

T. Skei and W. A. Bonner, Shell Oil Co. engineers, developed the process after 4 years of research.

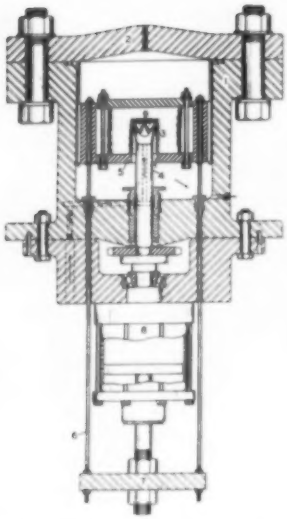
Nelson Refinery Construction Index

Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, Petroleum Refinery Consultant, Tulsa.
The Index was explained October 1, 1956, (page 110) as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issue of the months of January, April, July, and October.

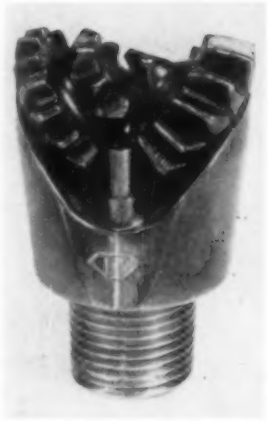
Index (1946=100)

	1949	1952	1954	1955	1956	April 1957
Pumps, compressors, etc.	135.9	155.6	166.5	172.2	192.0	203.7
Electrical machinery	130.9	152.4	160.0	162.5	175.0	187.3
Internal-combustion engines	124.8	146.5	150.5	153.2	164.0	173.5
Instruments	123.1	146.2	154.6	162.9	182.1	186.2
Heat exchangers	133.0	165.8	171.7	156.8	190.7	209.1
Miscellaneous equipment average	*121.6	153.3	160.7	161.5	180.5	192.0
Materials component	143.6	164.3	174.6	176.1	190.4	198.9
Labor component	137.1	163.1	183.3	189.6	198.2	204.0
Nelson construction index	139.7	163.6	179.8	184.2	195.3	202.0

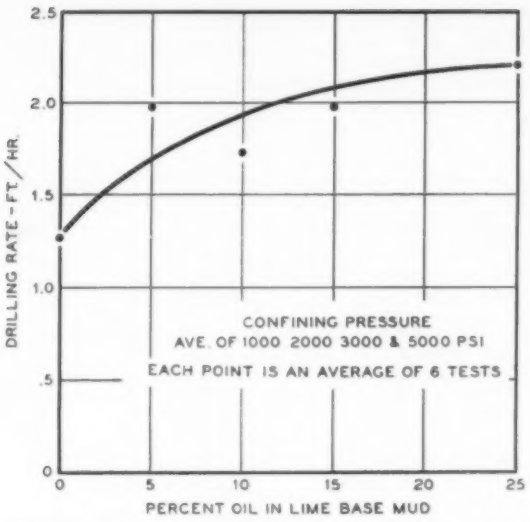
*Used in computing the Nelson Index until April 1952. This is slightly different than the average of the Miscellaneous Equipment Items shown above.



DRILLING chamber of high-pressure drilling equipment. Fig. 1.



DIAMETER of this bit is 1¼ in. Jets are 5/64 in. Fig. 2.



RESULTS of Test No. 1. Jet velocity, 215 ft. per second, bit weight 250 lb., 50 r.p.m. Each point is an average of six tests. Fig. 3.

How to Speed Drilling in Shale

Drilling mud can greatly affect drilling rate in shales. This article shows why and how oil improves rate and what effect water loss has. It also shows why jet action at the bottom of the hole is desirable.

By R. A. Cunningham and W. C. Goins, Jr.

GULF COAST shales exhibit drilling characteristics different from harder, more brittle formations. These formations under certain conditions tend to become gummy and cause bit balling. The nature of the drilling fluid can appreciably affect drilling rate in these formations.

...Use of oil in lime-base muds has been found to have the following effect on drilling:

1. Increases drilling rate as much as 150 per cent with increased oil content up to 15 or 20 per cent.

2. Improves the conditions necessary for better cutting efficiency of the bit teeth and increases the contribution of the dynamic fluid properties to drilling rate.

3. Decreases the tendencies of the shale particles to adhere to other shale particles or to the bit, resulting in reduced balling.

...Lowering mud fluid loss from 13.4 cc. to 2.4 cc. by adding starch results in reductions of drilling rates of about 20 per cent.

Soft shales are kneaded by the bit rather than fractured. The kneaded material is mixed with water or mud to a thick paste, which in severe cases extrudes up around the bit to cause severe balling. The presence of this kneaded mass is a function of the formation, drilling fluid, and action of the jets.

Testing method . . . The results presented here were obtained with a microbit drilling machine. With this equipment, more experimental variables can be tested in a shorter time than in field testing. Closer observation of the bit, formation, and drilling fluid is possible. The results should be directly applicable to field drilling practice since extraneous factors such as rig equipment, crews, hole depth, bits, and bit weights are eliminated.

Advantages of oil-emulsion muds based on field experiences have been reported by Weichert and Van Dyke[1] and Perkins.[2]

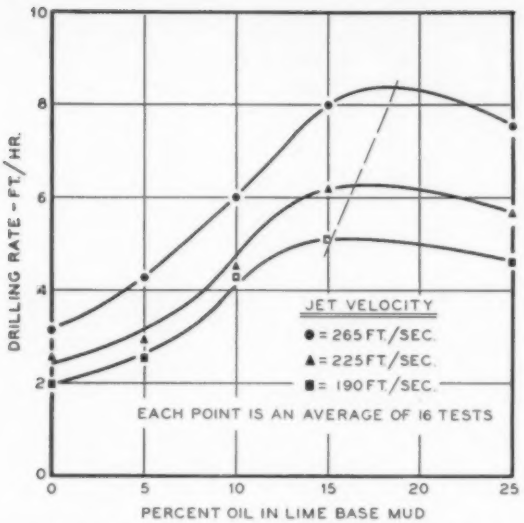
Laboratory Equipment

The microbit drilling equipment is built around a drilling chamber designed for high pressure drilling shown in Fig. 1. The drilling fluid is maintained at a test pressure within the confines of the drilling chamber (1) and (2). A 1¼-in. diameter rock bit (3) of Fig. 1 and Fig. 2 is mounted on a drill stem (4) within the chamber.

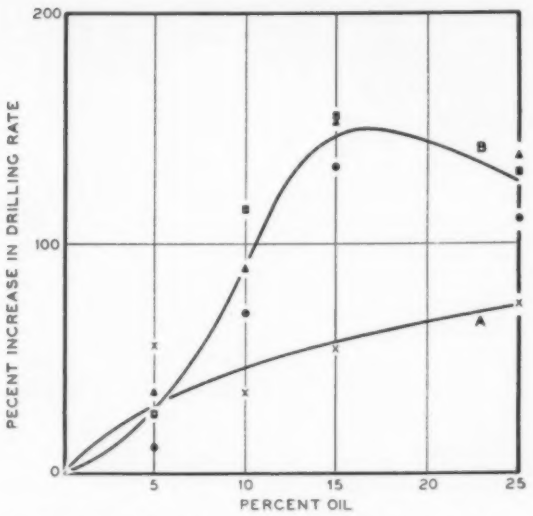
A 2 to 5-in. diameter by 2½-in. long formation core (9) is mounted in a specimen holder (5). This specimen holder with the rock moves in a vertical direction. Bit load is applied by an air cylinder (8) through connecting members (7) and (6) to the specimen holder (5). An additional load is applied by the pressure in the chamber pushing against the rods (6).

Circulation . . . The "chips" formed are removed by fluid entering the vessel from an external source and moving as indicated by the arrows through the drill stem and bit. The circulating system is closed with a pump circulating volumes as high as 12 g.p.m.

Authors are respectively with Hughes Tool Co., Houston, and Gulf Oil Corp., Houston. Article is based on a report to the Drilling Fluids Study Committee, A.P.I. Division of Production, at the 1957 spring meeting, Shreveport, La.


DRILLING RATE - FT./HR.
PERCENT OIL IN LIME BASE MUD
JET VELOCITY
● = 265 FT./SEC.
▲ = 225 FT./SEC.
■ = 190 FT./SEC.
EACH POINT IS AN AVERAGE OF 16 TESTS

RESULTS of Test No. 4. Jet velocities, 265, 225, and 190 ft. per second, bit weight, 500 lb., 50 r.p.m., confining pressure, 5,000 psig. Fig 4.



INCREASE in drilling rate vs. per cent oil. Curve A is from Fig. 3 and curve B is from Fig 4 Fig. 5.

within a pressurized system. The pressure is maintained in the entire system by a high-pressure, chemical injection pump capable of maintaining a maximum of 14,000 psi.

The 1¼-in. bit has two cutters and two 5/64-in. diameter jets (see Fig. 2). Jet velocities as high as 265 ft. per second have been attained.

Core Handling

The cores for the tests were in each instance either canned, wrapped and boxed, or sealed in lucite tubes as soon as taken to prevent drying. Because of "ringtail" spalling, the outside of the cores was irregular in shape. In order to prevent disintegration during drilling and to provide an easily mounted specimen, pieces of the shale cores were placed in cylindrical waxed cardboard containers and set in cement or plaster of paris. Each core piece was then cut into 3-in. lengths and sealed in cans until drilled.

The following describes the cores used.

Test No.	Formation	Depth, ft.	Field	State	Size, in.
1	Vicksburg	7,925-75	Pierce Junction	Texas	4½
2	Miocene	8,000-40	Timbalier Bay	Louisiana	4½
3	Wilcox	8,331-55	West Mission Valley	Texas	4½

Drilling Fluids

The drilling fluids used for these tests were conventional lime muds. To reduce the number of variables which could have an effect on the rate of penetration, all mud properties except the one being studied were held as nearly constant as possible throughout each series of tests.

The properties of the muds used are shown in Table 1. Table 2 lists the compositions.

Drilling Tests

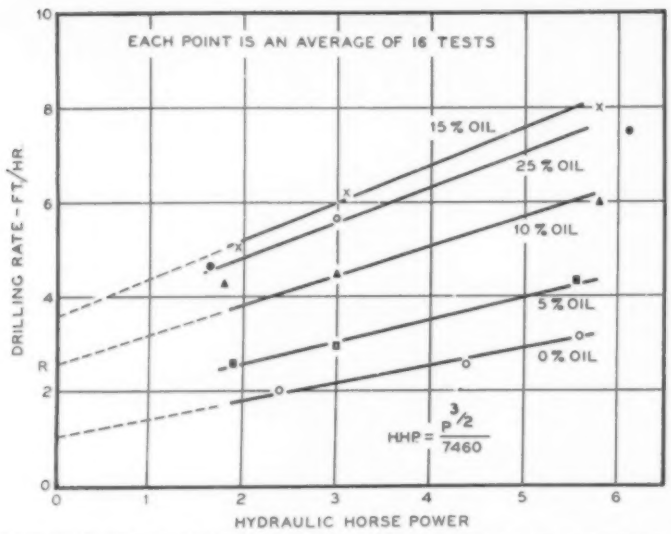
Core samples were subjected to a uniform hydrostatic pressure acting on all external surfaces by the drilling fluid. "External surfaces" includes the drilled-hole surfaces as they are generated.

Hydrostatic (or confining) pressure was used for two reasons: (1) pressure

TABLE 1—PROPERTIES OF MUDS USED FOR RATE OF PENETRATION TESTS

Mud No.	P_f alkalinity	Fann properties‡ AV	PV	YP	Initial gel	10-min. gel	Density (lb. per gal.)	A.P.I. fluid loss (ml.)	Cake (in.)	% by volume Oil content	% by volume Solids
Test 1											
1	6.8	25.5	25	1.0	1	2	13.4	10.6	3/32	0	20.2
2	5.2	28.3	27	2.5	1	1	13.4	10.6	5/32	15	20.6
3	5.9	26.5	27	—1	1	5	13.4	9.8	3/32	5	19.8
4	7.2	27.5	28	—1	1	8	13.4	8.0	3/32	10	19.7
4-A*	6.3	23.5	24	—1	1	1	13.4	5.3	2/32	10	19.7
5	4.4	33	31	4	1	1	13.4	11.4	8/32	25	20.5
6†	8.6	24.5	26	—3	0.5	1	13.4	6.2	3/32	10	19.7
Test 2											
7	5.2	34.5	33	3	0.5	3	13.8	7.0	2/32	0	20.3
8	6.1	37.5	36	3	0.5	1	13.8	5.2	2/32	5	20.5
9	5.0	39	36	6	0.5	1	13.8	6.6	2/32	10	20.8
10	7.2	34	34	0	0.5	1	13.8	5.6	2/32	15	20.7
11	6.5	47	42	10	0.5	1	14.0	3.6	2/32	25	21.0
Test 3											
12	7.9	35.5	31	9.0	2	57	13.4	13.2	4/32	0	20.0
13	6.8	41.3	37	9.5	1	18	13.4	7.2	3/32	0	20.0
14	6.8	39.0	35	8.0	1	2	13.4	3.4	1.5/32	0	19.8
15	5.4	43.3	37	12.5	1.5	12	13.4	2.4	1/32	0	19.8

*4-A—Emulsifier "A" added to mud No. 4 after running 10 per cent oil test. †Duplicate of mud No. 4 with emulsifier "B" added. ‡AV—cp.; PV—cp.; VP—lb. per 100 ft.²



DRILLING rate vs. hydraulic horsepower with per cent oil as a parameter. Straight lines represent data, Fig. 6.

placed the rock in a condition more nearly like down-hole conditions than testing under atmospheric conditions; (2) the compressing effect of pressure produced a stronger and more uniform material. While this confining pressure was maintained, drilling proceeded and drilling rate was determined as a function of the mud properties.

Pressure dependence . . . The effects of pressure on physical properties and drilling rates of different rocks have been shown in previous investigations. Jacketed rock cylinders exhibit an increase in compressive strength with confining pressure as shown by Adams,[3] Handin,[4] Bredthauer[5] and others. Unjacketed but nearly impermeable core samples demonstrate a decrease in drilling rate with increased confining pressure under laboratory drilling conditions.[6]

In general, this decrease in drilling rate is proportionately greater in soft shales than in harder formations.

The present series of tests were started with pressure of 0, 500, 1,000, 2,000, 3,000 and 5,000 psig. only to be sure the test variables reacted the same under different pressures. Scatter was excessive at 0 and 500 psig. resulting in data of little value.

Results obtained with 1,000, 2,000, 3,000 and 5,000 psig. showed that pressure only shifted the drilling-rate curve down with increasing pressure. Tests were then altered to use only 3,000 and 5,000 psig. and later only 5,000 psig.

Sampling care . . . Testing formation cores of this type requires two considerations for proper sampling. (1) Samples must be taken throughout a section to be representative of the section. (2) Enough tests at each condition must be made so that a statistical average represents the effects of the variables tested.

Each value reported in these tests is an average of 6 to 20 tests. Tests were designed so that each test condition would contain samples from points scattered throughout the total length of the core.

TABLE 2—COMPOSITION OF MUDS USED FOR RATE OF PENETRATION TESTS

Mud No.	Water	Bentonite	Low-yield clay	Barite	Caustic	Quebracho	Lime	Fluid loss agent	Oil
1	79.5	8.9	27.5	328	3.2	2.8	7.5	1.3	0
2	67.5	6.7	21.0	410	3.2	2.8	7.5	0.9	15
3	67.5	7.5	21.0	359	3.2	3.2	8.0	1.1	5
4	67.5	7.0	21.0	374	3.4	3.4	8.0	0.8	10
4-A	67.5	7.0	21.0	374	3.4	3.4	8.0	0.8	10
5	54.5	7.6	23.4	536	3.0	3.0	8.0	1.0	25
6	67.5	7.0	21.0	374	3.4	3.4	8.0	0.8	10
7	79.5	8.9	27.5	328	3.2	5.3	7.5	1.3	0
8	75.0	10.5	21.0	364	3.2	2.8	7.5	1.1	5
9	68.5	12.0	21.0	398	3.3	2.8	8.0	0.3	10
10	64.5	10.0	21.0	423	3.0	2.8	8.0	0.4	15
11	54.5	10.0	21.0	543	3.0	2.8	8.0	0.2	25
12	79.4	12.9	30.9	315	4.4	5.0	10.0	0	0
13	79.4	12.9	30.9	315	4.4	5.0	10.0	2.5	0
14	79.6	9.96	30.9	315	4.4	6.3	10.0	5.0	0
15	79.6	9.96	30.8	315	4.4	6.6	10.0	6.4	0
16	69	11.6	30.2	384	4.2	4.8	9.5	2.1	10.6
17	69	11.6	30.2	384	4.2	4.8	9.5	2.1	10.6
18	69	11.6	30.2	384	4.2	4.8	9.5	2.1	10.6
19	68.5	12.0	21.0	398	3.3	2.8	8.0	0.3	10
20	68.5	12.0	21.0	398	3.3	2.8	8.0	0.3	10
21	68.5	12.0	21.0	398	3.3	2.8	8.0	0.3	10

Variables . . . Bit weight was varied with different shales, from 250 lb. to 750 lb. on a 1¼-in. diameter bit. Experience has shown that for this laboratory equipment 1 to 15 ft. per hour drilling rate gives the best test conditions. Bit weights were adjusted to hold the results within this range.

Two complete series of tests were made with oil contents in the mud of 0, 5, 10, 15 and 25 per cent.

By necessity the first series of tests was used in working out procedures and practices. During the second series of tests better use of the available material was made, with the result that conditions under three different fluid rates were used—8.1, 6.8 and 5.6 g.p.m. For the two 5/64-in. diameter nozzles these rates resulted in approximately 265, 225, and 190 ft. per second jet velocities.

A third series of tests was made varying fluid-loss properties of the mud. This varied from 2.4 to 13.2 cc.

Test Results

1. Variation in oil content.

Separate tests were made using two different shales. Both tests indicated improvements in drilling rates that can be obtained with added oil. In these tests there are no friction losses between the drill stem and the wall of the hole that can hold back weight on bit. Any improvements, therefore, occur at the bit.

The results of Test No. 1 are shown in Fig. 3. The conditions of the test were: jet velocity, 215 ft. per second; bit weight, 250 lb.; 50 r.p.m. Each point is an average of values obtained at 1,000, 2,000, 3,000 and 5,000 psi. confining pressure, on Vicksburg shale from Pierce Junction, Tex. The irregularities in the points result in part from early test procedures, but the effect of the oil content in the mud is evident. Five per cent of oil caused a large increase in drilling rate. Twenty-five per cent resulted in a continuing increase.

The results of Test No. 2 are shown in Fig. 4. Test conditions were: jet velocities, 265, 225, and 190 ft. per second; bit weight, 500 lb.; 50 r.p.m.; confining pressure, 5,000 psig.; Miocene shale, Timbalier Bay, Louisiana. Drilling rate increased with increased oil to an oil content of between 15 and 25 per cent. Twenty-five per cent

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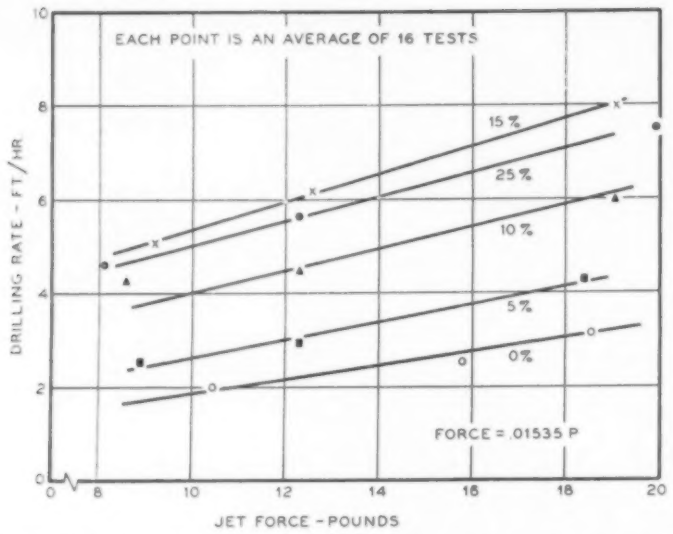


DRILLING rate vs. force of the jet with per cent oil content as a parameter. Straight lines represent results. Fig. 7.

was definitely beyond the optimum oil content.

The occurrence of an optimum oil content is in agreement with observations by Eckel,[7] in some West Texas drilling. At 15 per cent oil, the drilling rates were about 150 per cent greater than with no oil. As would be expected drilling rate is faster for the greater jet velocity and flow rate.

Optimum conditions . . . If the data of the two preceding tests are plotted together as per cent increase in drilling rate vs. per cent oil, the first group of tests (Curve A, Fig. 5) indicate that 5 per cent oil increases drilling rate markedly while succeeding increases in oil show smaller increases.

The second test (Curve B is an average for three different jet velocities) shows that improvement in drilling rates are obtained with oil up to 15 per cent or more and further increase to 25 per cent actually decreases drilling rate. Because of the experience and better planning that went into Test No. 2, the results are considered to be more significant.

From Fig. 4, there is an indication that the optimum oil content may vary slightly with the dynamic properties of the mud as shown by the dashed line drawn through the maximum points on the curves. It may also be inferred from Fig. 5 that the drilling rates in one shale may improve more with oil added than in another shale. At present, the validity of these observations must remain subject to further testing.

Although secondary to the purpose of the test, it is of interest to use this information to plot drilling rate as a function of other quantities than can be determined. Possibly the two quantities of most interest are hydraulic horsepower and force of the jet stream, and a comparison of their effect on drilling rate was made. The fundamental data are limited because only three flow rates and constant nozzle diameter were used. The pressure drop across the bit was measured and used to calculate volume rate of flow, hydraulic horsepower, and jet force directly. [For fixed nozzle size, hydraulic horsepower is proportional to (pressure)$^{3/2}$ and jet force is proportional to (pressure)^{1}.]

Effect of oil . . . Fig. 6 shows drilling rate vs. hydraulic horsepower with per cent oil as a parameter. The family of straight lines as shown appears to represent the data. These can be represented by:

$$\text{Drilling rate} = R_o + (M)\ (\text{h.hp.})$$

where

R_o = intercept with ordinate

M = slope of line

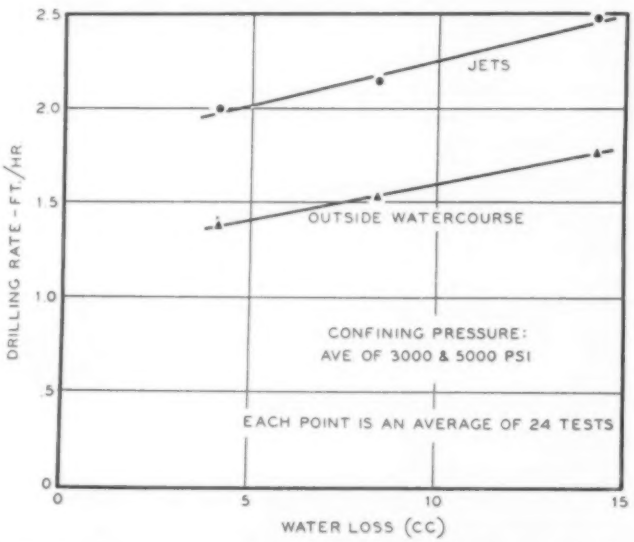
R_o is then some measure of the cutting ability of the bit. M is a measure of the effect of fluid action on drilling rate. Calculation of R_o and M is as follows:

Oil content, per cent	0	5	10	15	25
R_o	1.06	1.64	2.58	3.60	3.32
M	.368	.466	.624	.796	.746

The addition of oil enables the bit to do its work better as R_o increases. The addition of oil also enables the drilling fluid to do its work better as M increases. The percentage increase in R_o is greater than the percentage increase in M indicating the addition of oil helps the bit action more than it helps the fluid. As will be seen later, bit balling may be one reason why R_o varies with oil content.

Continuous force of the jet (deflected 90°) is the product of flow rate and jet velocity which Eckel and Nolley,[8] as a result of study of work reported by Nolley, Cannon, and Ragland,[9] report to be proportional to drilling rate for drag bits. Fig. 7 shows drilling rate vs. force of the jet with per cent oil content as a parameter. Again a family of straight lines appears to represent the results.

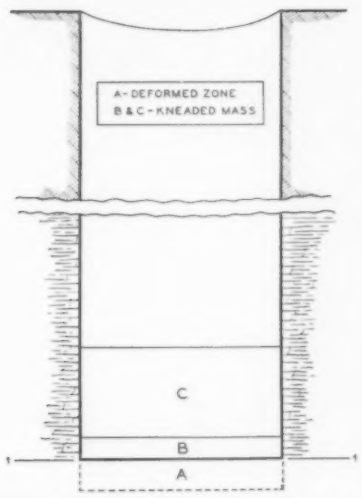
2. Variation of fluid-loss properties. Results of Test No. 3 using muds with varying water loss properties are shown in Fig. 8. Fluid loss varied



EFFECT of water loss on drilling rates, 1¼-in. bit, 750-lb. bit weight, 50 r.p.m. Fig. 8.

CONDITION of filter after drilling with mud containing 15 per cent oil. Fig. 9.

CONDITION of filter after drilling with mud containing 25 per cent oil. Fig. 10.



HOLE SECTION showing kneaded mass in shale at the hole bottom. Fig. 11.

BOTTOM-HOLE PATTERN obtained with first model 1¼-in. jet bit. Fig. 12.

from 2.4 cc. to 13.4 cc. The mud description was given earlier. Decreasing fluid loss resulted in a decrease in drilling rate. Comparing the drilling rate using 2.9 cc. with 13.4 cc. the decrease is about 20 per cent and appears linear in between. (The 2.9 is an average of 2.4 cc. and 3.4 cc., results of which were averaged.)

It is difficult to understand what effect fluid loss can have on an almost impermeable material. Perhaps the answer is the "almost" and the fact that new bottom is being uncovered continually. It is possible that a minute filter cake is laid down on newly uncovered bottom because the filtrate tends to move into the "almost" impermeable shale or into minute cracks. This would tend to hold the formation in place as long as a pressure drop remained across the filter cake.

Another possibility lies in the materials used to decrease the fluid loss. The starch content varied from 0 for the 13.4-cc. mud to 6 lb. per bbl. for the 2.4-cc. mud. If a little oil in mud can change the drilling rates, surely variations in starch or other materials can also affect drilling rate. Possibly it is this variation that is reflected in the test results rather than the fluid loss.

3. Effect of Emulsifiers with oil.

Limited work has been done on the effect of using emulsifiers with oil. In all cases a mud with 10 per cent oil plus an emulsifier was compared with a mud containing 10 per cent oil. In one formation under one set of jet conditions, one emulsifier showed about a 25 per cent improvement in drilling rates. Under other jet conditions or on other formations no improvement was observed in these tests. In many cases the data were not complete enough to draw any sound conclusions.

4. Use of water for drilling fluid.

Water as a drilling fluid was used to compare with lime-base muds in Vicksburg shale. The water contained 10 per cent rust inhibitor. Previous tests indicated that the rust inhibitor had no appreciable effect on drilling rates. Bit weight, jet velocities and r.p.m. were equal with both water and mud (250 lb., 220 ft. per second and 500 r.p.m., respectively).

Drilling rates with water were about 5 to 15 times as large as with mud. With water, the hole was enlarged and irregular in shape. With mud, gage hole was maintained.

Bit Balling in Shale

Severe balling of the bit was an early problem. As a result, some studies of the causes and of the effect of oil content on balling were made.

The effect of oil content on bit balling was most pronounced in Test No. 2. (Test No. 2, drilling rate vs. oil content was described earlier and the results shown in Fig. 4.) Balling occurred in varying degrees from no balling to very heavy balling. For the purpose of comparing each test, these were listed as either balled or not balled. The percentage of balled bits in tests at each oil content is listed in the following table:

Per cent oil content	0	5	10	15	25
Per cent balled bits	100	89	56	22	11

With increased oil, balling decreased. The drilling rate was maximum at about 15 per cent oil but balling continued to decrease with added oil.

Oil's action . . . In this test, oil apparently had the effect of keeping the tiny shale particles apart, preventing them from sticking together or sticking to the bit. From this standpoint the ideal fluid would be one which

Bit balling in shale . . .

"Severe balling of the bit was an early problem. As a result, some studies of the causes and of the effect of oil content on balling were made."

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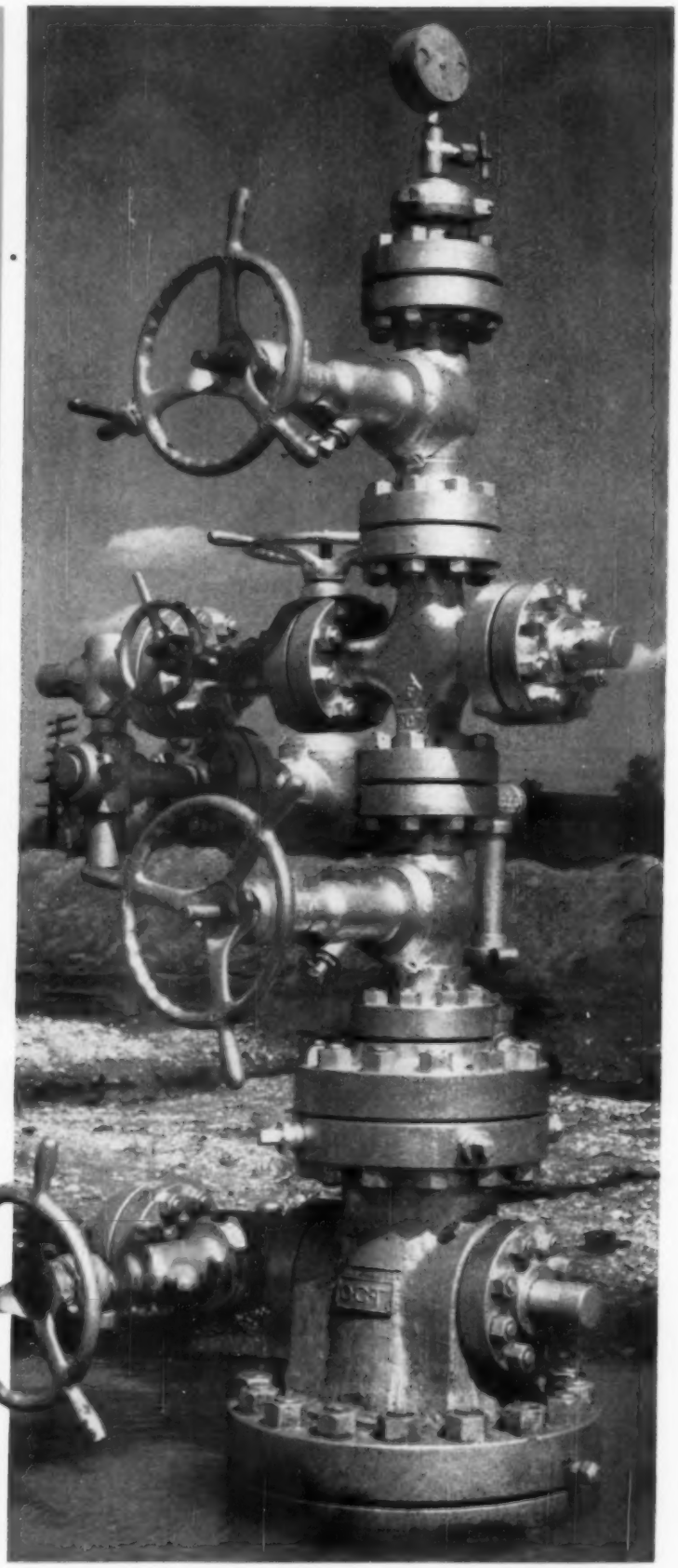

HOLE after drilling 1½ in. in Wilcox shale. Test No. 3. Fig. 13.

BIT after drilling hole in Fig. 13. The bit was balled and the hole was completely filled. Fig. 14.

would keep the shale in a powdery or granular form.

This effect was noted again in the filter. The filter is a 40-mesh wire screen. After each test was completed, the mud was cleaned out of the equipment and the filter was removed and cleaned.

After the tests with 0, 5, and 10 per cent oil, the filter screen was covered with a thick layer of shale paste which was difficult to remove. With 15 per cent oil, the shale had fallen to the bottom of the container and the screen was clean as shown in Fig. 9. With 25 per cent oil, there was shale on the screen but not cemented to it as before and was easily removed, Fig. 10.

In all of these tests, there were sizable cuttings which came through undamaged. However, enough of the formation was ground to powder to cause the forming of the paste with its resulting effects.

Formation of paste . . . The balling that occurred was the subject of additional studies. One simple test consisted of grinding a shale sample into a powder. There was water in the shale but not enough to make the particles stick together. A small amount of water was added. Immediately the shale powder absorbed enough water to make a sticky, gummy paste. Additional water did not break down this paste very well. With much working and washing this paste could finally be dispersed.

Similar effects appear in drilling with the laboratory rock bit. Fig. 11 represents a drilled hole. The rock bit is not shown. Line 1-1 represents the approximate surface on which the teeth are acting. Ahead of this surface in the region A, the shale is beginning to be disturbed. Tiny openings are formed. The fluid tends to run into these openings while the solids in the mud are held back at the surface.

As the bit advances the shale becomes more kneaded until the water content causes it to become a mass that varies from a stiff putty to a sticky paste. This paste (or kneaded mass) is shown by the area B. In some extreme cases this paste may continue to extrude up around the bit as seen by C; but the paste was always present in the tests.

The presence of the sticky material in B depends on the formation, drilling fluid, and jet action. In some cases jets can remove nearly all of it. One early model of a jet microbit left a portion of this paste in the center of the hole bottom as in Fig. 12. In one extreme case this paste filled a good portion of the hole as in Fig. 13, with a resulting severe balling of the bit as in Fig. 14.

Water or mud plus shale, plus rock bit form the raw materials and machinery of an excellent gumbo-making factory. Apparently, the gumbo-like material is a factor in drilling—the degree varying with formation, jet action and mud properties; subject to control by variation in oil content.

Acknowledgment

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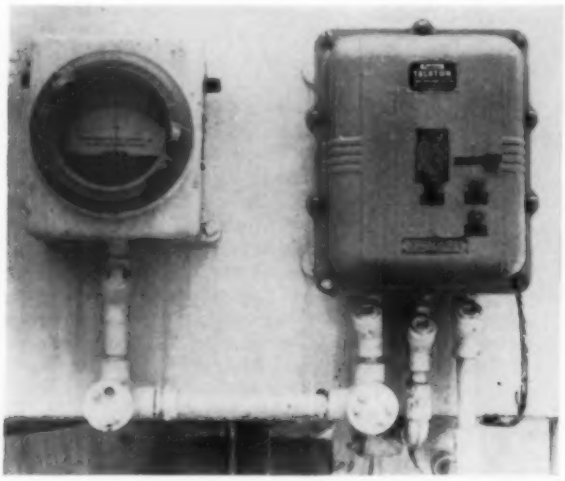
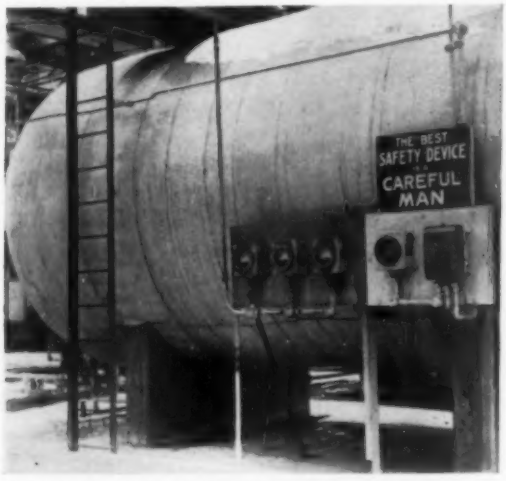


ORIGINAL electronic level indicator installed for 1-year test. Explosionproof gage (left), indicator (right).



ELECTRONIC level indicators on 30-ft. sulfur dichloride tank at Bayway refinery of Esso Standard Oil Co.

No clogging or cleaning when . . .

Electronic Indicators Measure SCl_2 Level

A 1-YEAR test by instrument experts at Esso Standard Oil Co.'s Bayway refinery, Linden, N. J., demonstrates that electronic devices can measure levels in sulfur dichloride tanks, where conventional gage-glass indicators became clogged and undependable within a week.

When the glass indicators needed cleaning, two or three men were required, and the job was scheduled only when the tanks were empty. Cleaning these 30-ft.-long sulfur dichloride tanks was a difficult and time-consuming job and was done usually with gas masks.

Sulfur dichloride, employed in producing additives for motor oil, is a noxious toxic material that gives off chloride gas at atmpospheric temperature and pressure. Conventional gage-glass indicators used for measuring level in the chemical tanks prior to the installation of electronic devices, became caked and coated with sulfur dichloride deposits after a few weeks' use.

In June 1956, instrument technicians at Bayway refinery installed the first electronic level indicator on a test basis, choosing a sulfur dichloride tank where other gaging means had proved unsatisfactory. A simple one-tube electronic indicator, perfected by Fielden Instrument Division, Robertshaw-Fulton Controls Co., was used.

The original installation, made about a year ago, has not required maintenance and has given accurate level indication.

Because of the satisfactory performance of the test installation, additional electronic level indicators are being used on other sulfur dichloride tanks at the refinery. These measuring units are placed at the top of each tank about 10 ft. from the point where a 120-in. plastic insulated probe is extended into the tank. Duplicate indicators, used as repeating meters, will be installed on the panelboard in the refinery's control room, thereby providing remote level indication of the sulfur dichloride tanks.

STEAM-CARRYING pipeline is protected by aluminum jacket.

Aluminum Jacket Protects Steam-Carrying Line

A NEW steam-carrying pipeline system that is protected from rain, snow, dirt, and ice by an aluminum jacket, now is in operation at Esso Standard Oil Co.'s Bayway refinery.

The aluminum application, one of the largest of its type, employs 80,000 lb. of alloy 3003 sheet produced by Aluminum Co. of America. It shields 5½ miles of large diameter,

insulated steel pipe from damaging weather and a corrosive industrial-marine atmosphere.

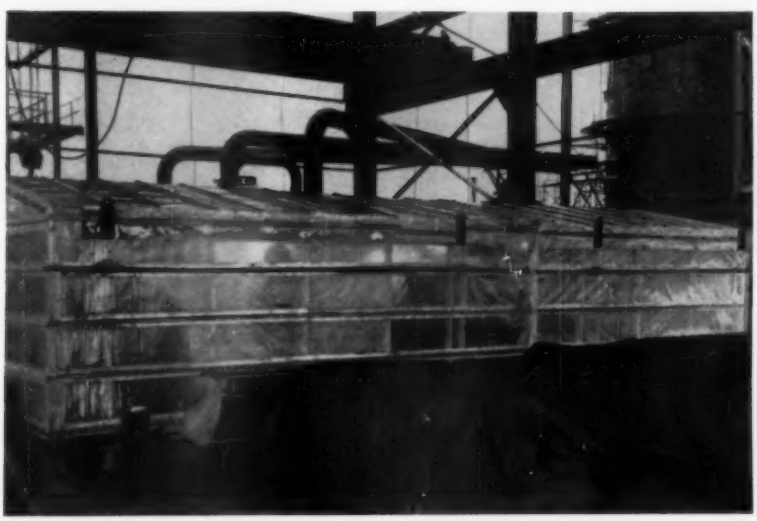
According to Esso, insulating and jacketing the lines has cut heat loss to only 5 per cent of that experienced with bare pipe. An expenditure of more than $500,000 would be required annually to replace the heat that would escape if the pipelines were not insulated and protected.

Designed by engineers from Esso and several consulting firms, the new pipelines link refinery facilities and the recently completed Linden generating station of the Public Service Electric & Gas Co. Nearly all steam required in the refinery's processing operations now is supplied by the station through two 30-in. low-pressure lines and one high-pressure 20-in. line.

In addition to the process steam pipelines, a 16-in. low-pressure line delivers steam to the refinery's waterfront area, and two 8-in. steam-traced lines carry fuel oil to the power station. To keep the oil flowing, these lines also have been insulated and jacketed with aluminum.

The lines were first wrapped with the blanket-type insulation, followed by a layer of 15-lb. roofing felt. Aluminum sheet was cut to size, shaped and punched prior to reaching the job site. When installed, the easily handled sections were drawn tightly around the felt-covered insulation, and secured with self-tapping screws. Complete weatherproofing was insured by the careful overlapping of adjacent sheets.

At elbows and fittings in the pipelines, mineral wool insulating-finishing cement and asphaltic mastic weatherproofing compound were used in place of aluminum sheet. These sections were coated with aluminum paint to preserve the neat appearance afforded the new pipeline system by the bright, light metal jacketing.



ALL-WEATHER shelter made with polyethylene-covered frames.

Polyethylene film used for protection

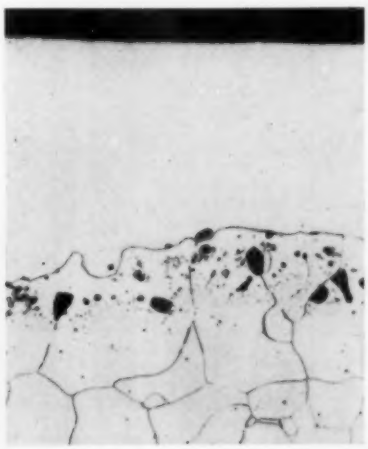
. . . withstands weather, chemicals

TO protect machinery being assembled in the open from corrosive sea air at its new ultramodern refinery, Tidewater Oil Co. has constructed an inexpensive type of all-weather shelter with film made of polyethylene. Tacked to knockdown wood frames, the tough film withstands rain, snow, and winter winds and is inert to most chemicals.

Construction is basically the same as for low-cost, polyethylene-film greenhouses which are now being erected throughout the country. The film is exceedingly light in weight and simple to install. Because the film is translucent, construction workers can assemble machinery in natural light.

Tidewater's Delaware Flying A refinery is situated 15 miles south of Wilmington near the Delaware River where corrosive sea air is a major problem.

IDENTICAL 1½-in. pipes, one Niphos clad, the other untreated.



CROSS-SECTION of pipe. Darkened areas or islands are alloys.

Nickel Alloy Coatings Guard Against Corrosion

A SIGNIFICANT increase in service life for tubing and pipe subjected to highly corrosive agents in oil-refinery and petrochemical-plant piping systems and heat-transfer equipment is available in the form of Niphos nickel-alloy coatings. After application, the coating is fused by heating in a reducing atmosphere, into a protective nickel-allow cladding.

The coating, or cladding actually forms an interface with the base metal. No evidence of flaking, peeling, or exfoliation is encountered even after 180° bends so often required in return-bend heat-exchanger tubing.

Since the coating also provides effective heat resistance to temperatures as high as 1,150° F., it prevents scaling of the base metal.

Process is available from Tube Reducing Corp., Wallington, N. J.

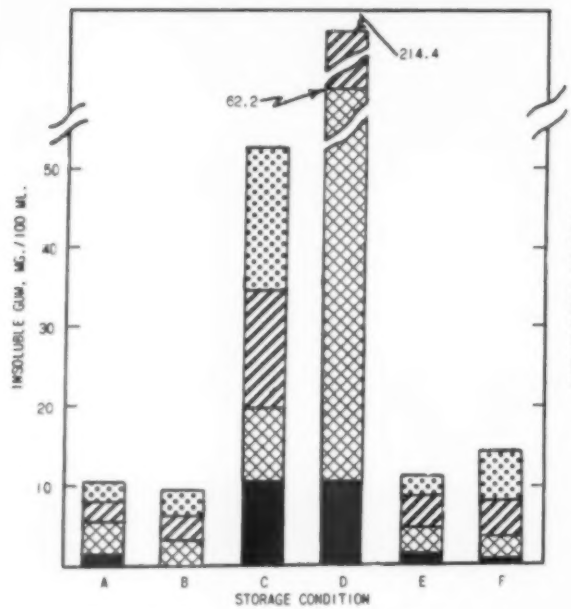
Part 5

REFINER'S NOTEBOOK

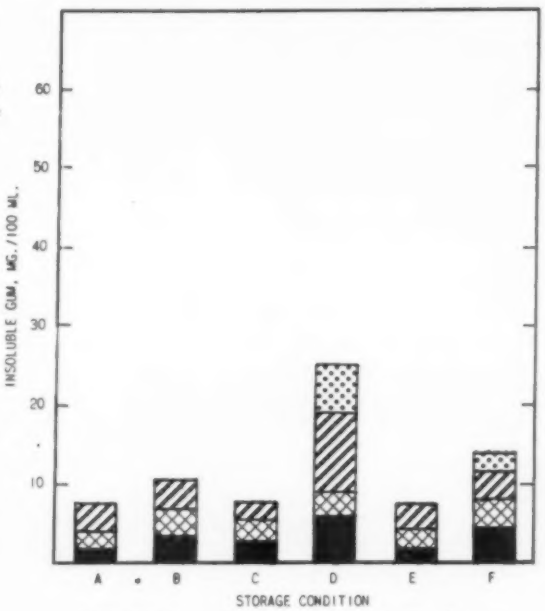
Storage Stability

Blending Effects Bring Up Specific Questions

By F. G. Schwartz and C. C. Ward



CANADIAN thermally cracked fuel. Fig. 1.



CANADIAN catalytically cracked fuel. Fig. 2.

STORAGE TIME: Black area, 6 weeks; crosshatched area, 13 weeks, diagonal lines, 26 weeks, dotted area 30 weeks. STORAGE CONDITIONS: A-fuel as received, B-fuel, plus tap water, plus iron wire, C-fuel, plus copper wire, D-fuel, plus copper wire, plus sea water, E-fuel, plus iron wire, and F-fuel, plus galvanized iron wire, plus sea water.

AT the beginning of this program the problem of incompatibility or reaction of blended fuels to produce excessive gum was recognized as one of the problems to be investigated.

Whenever the determined gum value for the blend exceeds the average value of the blend components, the blend is said to be incompatible, and if the determined gum value for the blend is less than the average value of the blend components, the blend is said to be supercompatible.

When blends of these fuels were made, one bottle was blended for immediate analysis. These samples were allowed to stand at ambient temperature for approximately 3 days before analysis. In no case was there any precipitate or other evidence of immediate incompatibility within this 3-day period. Incompatibility in storage is illustrated and discussed in the supplemental W.P.R.A. report.

Authors are with Petroleum Experiment Station, Bureau of Mines, USDI, Bartlesville, Okla.

Supplemental Blends

After inspection of the data derived from storage of the original 60 blends, it was decided that further blending was necessary to answer specific questions about blending effects.

Accordingly, several series of samples were prepared to investigate the effects of several variables in blending, as indicated in the following list.

Blend series number	Description of blend
200	Comparison of fuels stored in air and in an inert atmosphere.
300	Additional binary blends for additional incompatibility data.
400	Thermally cracked fuels added to blends of straightrun and catalytically cracked fuels.
500	Blends in which percentages of components are varied.
600	Blends of fresh fuels and unfiltered aged fuels.
700	Blends of fresh fuels and filtered aged fuels.
800	Blends of fuels and pure hydrocarbons.

200 series blends: Comparison of fuels stored in air and in an inert atmosphere. The purpose of the 200 series blends of fuels was to show the effect of oxidation on gum formation, and the following conclusion may be drawn: Oxidation is a major if not the principal factor in gum formation in all of the fuels tested; however, after the initial oxidation gum may be formed by polymerization of portions of the fuel that have been previously oxidized.

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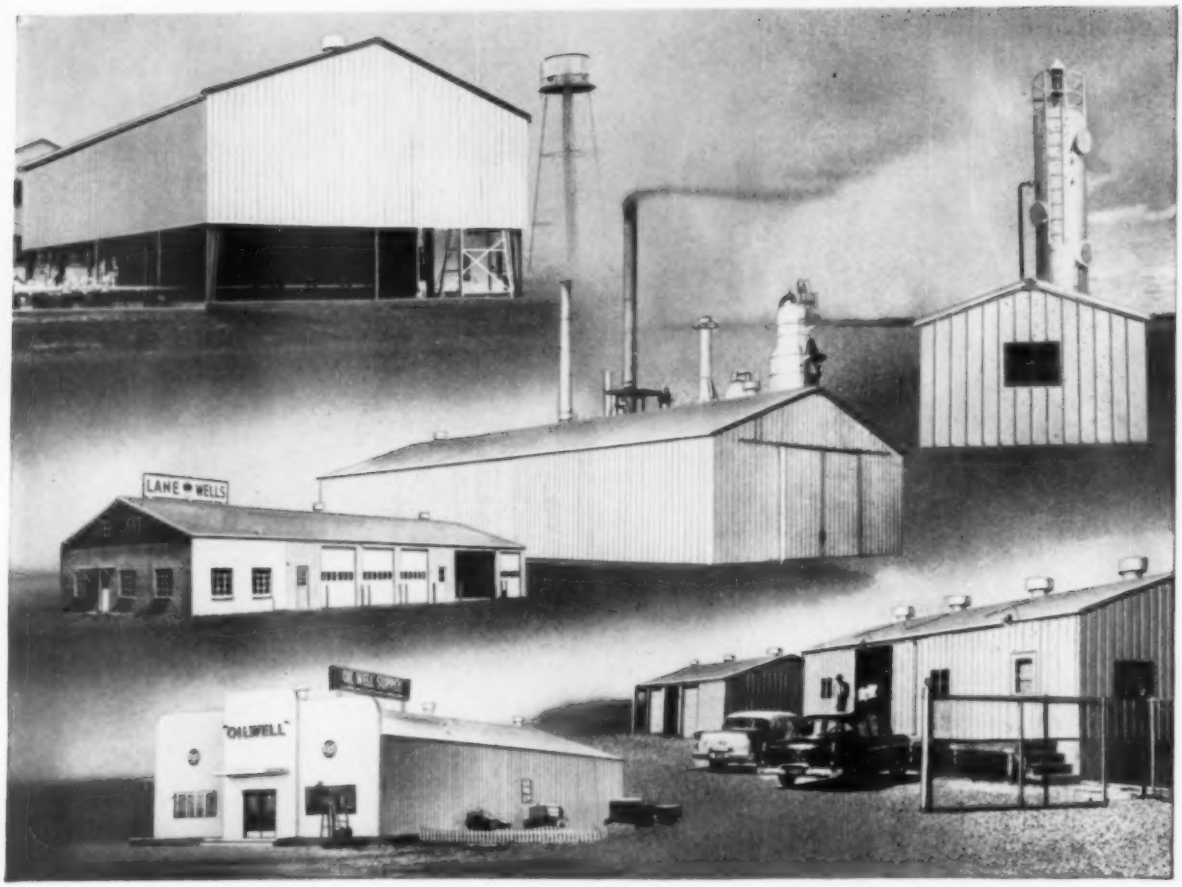

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By W. L. Nelson
Technical Editor

COST-imating

36. Construction Costs

The Nelson Index for the cost of constructing complete refinery units or refineries is published in the first issue each month of The Oil and Gas Journal. As early as possible each year (January or February) a summary in the form of a chart is published.[1] In addition the cost indexes of more than 40 items of engineering are published in the first issues of the months of January, April, July, and October.

THE PROPORTIONS between the amount of structural steel, plate steel, concrete, insulation, pumps, compressors, machinery, instruments, heat exchangers, electrical equipment, etc., for actual installations were tabulated[6] for the several types of petroleum-refinery constructions, such as gas-recovery or natural-gasoline plants, high-pressure equipments, etc. Most material items could be grouped under common headings such as steel or building materials, and other special equipment was grouped under the heading of miscellaneous equipment.[6]

Inasmuch as the cost of finished steel or other finished equipment varies more widely than the prices of raw materials, each item of cost, whenever possible, was broken down into raw-material cost and the cost of the labor required to finish the raw material into machines, structures, or equipment, and such labor costs were added to the normal cost of assemblying and erection.[6,7] On such a basis, the cost items may be grouped as in the Nelson Index:

Materials and component:	Per cent
Iron and steel	*20
Building materials	8
Miscellaneous equipment	*12
Labor component:	
Skilled construction	30
Common labor	30
Nelson Index	100

*Before August 1956, iron and steel was 24 per cent and miscellaneous equipment was 8 per cent.

The basic year is 1946, and all current prices or costs are stated as the ratio of the current price to the 1946 price. The same ratio or index can be obtained from cost indexes for the current date and the year 1946. The costs (1946) for many items of equipment have been published in the current Cost-imating Series (31 pages since November 7, 1955, at 2 to 4-week intervals), as well as in the original Cost-imating Series which appeared each week throughout October 21, 1948, to December 29, 1949. Additional equipment costs were also published in special Cost-imating issues.[3-5] The Nelson Index is applicable primarily to the costs of somewhat complete process units or refineries, and accordingly, in correcting the costs of specific items of equipment to other years, the indexes of the specific items as shown in the Cost-imating Series or in Quarterly Itemized Cost Indexes,[2-5] should be used.

Labor component . . . This is the average of common and skilled labor rates in 20 American cities, obtained from Engineering News Record. Skilled labor is the average of three trades, i.e., bricklayers, structural-iron workers, and carpenters. As more and more labor-saving machinery is employed, the proportion[7] between labor and material is expected to approach 55:45 at some date such as 1975.

Materials component . . . Although only three groupings of materials are used in computing the materials component, the total number of items included in the average exceeds 190. Most of these are obtained from Bureau of Labor Statistics (wholesale prices) but some of the miscellaneous equipment costs are obtained from manufacturers.

TABLE 1—MATERIALS ITEMS USED IN NELSON REFINERY CONSTRUCTION COST INDEX

Kind of materials:	No. of items
Iron and steel scrap	2
Semifinished steel—billets, rods, skelp, and alloy slabs	6
Finished steel—rails, spikes, bolts, concrete reinforcing rod, plates, structural bars (tool steel), alloy bars, carbon steel bars, sheets, strip, pipe, boiler tubes, wire, nails, fencing, tin plate, etc.	43
Iron ore, delivered	2
Foundry and forge products—steel castings, drop forgings, smith forgings, gray iron, molds, chilled iron, and pipe	9
Pig iron and ferro alloys	7
Nonmetallic building materials (Code 13):	
Glass—plate, window, and safety	4
Concrete ingredients—cement, sand, gravel, and stone	4
Concrete products—blocks and pipe	3
Clay products—brick, tile, and pipe	9
Insulation, lime, plaster, asbestos, and roofing	13
Miscellaneous equipment:	
Pumps and compressors (Code 11-41)	6
Electrical machinery (Code 11-7)—motors, transformers, switch gear, instruments, welding equipment, lamps, etc.	62
Diesel and gas engines (Code 11-54)	8
Heat exchangers	4
Instruments	9

TABLE 2—NELSON REFINERY CONSTRUCTION COST INDEX SINCE 1926

Year	Misc. equip.	Material component	Labor component	Nelson Index
1926	94.0	87.7	61.5	72.0
1928	89.0	93.2	64.5	71.0
1930	84.0	76.0	66.5	70.3
1932	79.0	68.0	49.0	56.6
1934	74.0	73.5	55.5	62.7
1936	77.0	78.2	60.0	67.3
1938	81.0	84.7	71.5	76.8
1940	83.0	82.2	74.5	77.6
1942	85.0	86.2	82.0	83.7
1944	88.0	87.6	88.5	88.1
1946	**100**	**100**	**100**	**100**
1947	114.2	122.4	113.5	117.0
1948	122.1	139.5	128.0	132.5
1949	121.6	143.6	137.1	139.7
1950	126.2	149.5	144.0	146.2
1951	145.1	164.0	152.5	157.2
1952	153.1	164.3	163.1	163.6
1953	158.8	172.4	174.2	173.5
1954	160.7	174.6	183.3	179.8
1955	161.5	176.1	189.6	184.2
1956	180.5	190.4	198.2	195.3

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8. Effect of Improved Construction Techniques . . . , The Oil and Gas Journal, March 15, 1954, p. 157.

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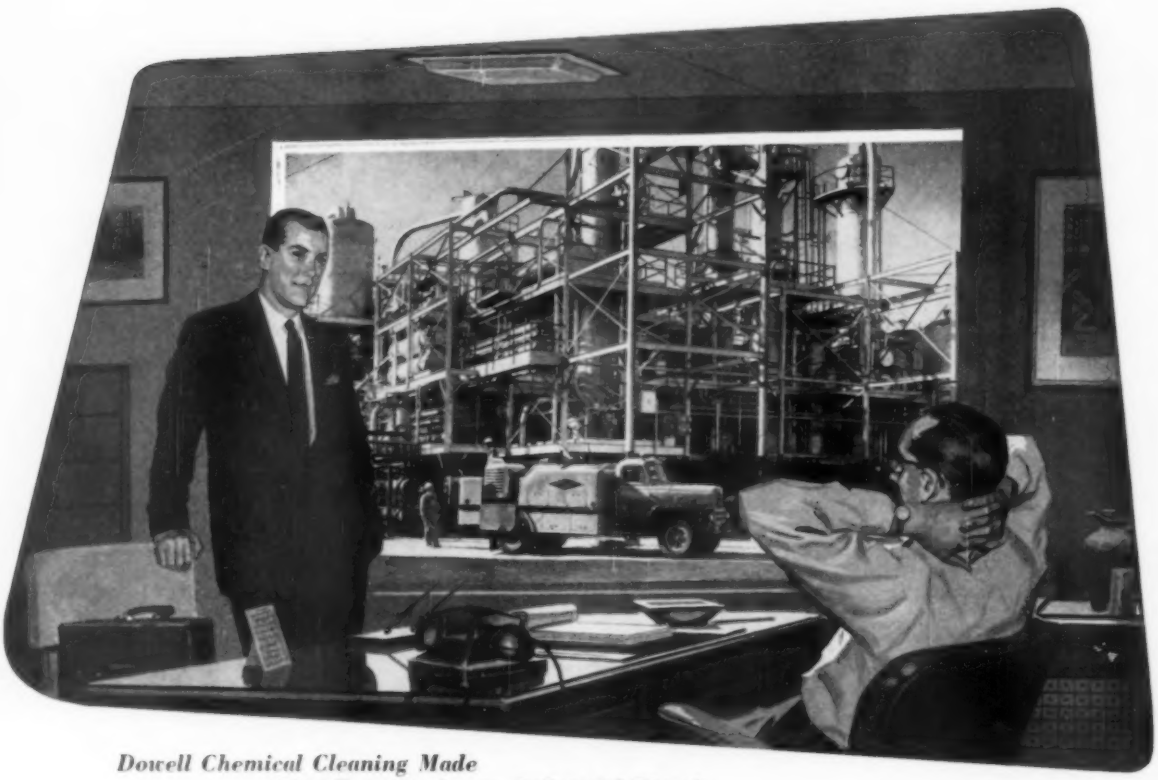

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In 1956 the program was continued. The result: still more savings. Eventually, chemical cleaning on a continuing year-around basis is expected to effect savings of from $300,000.00 to $500,000.00 annually.

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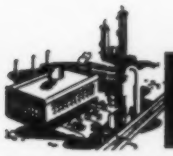
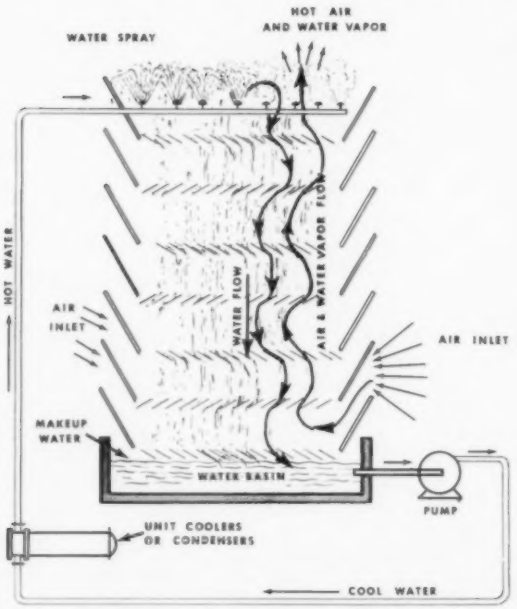
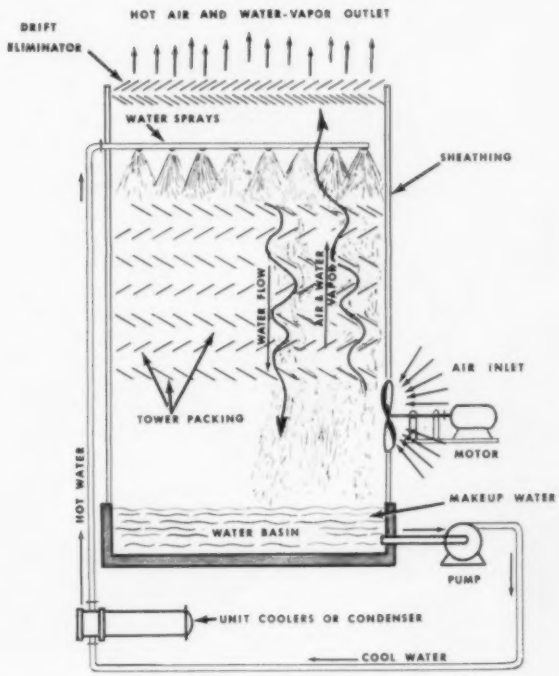


JOB IMPROVEMENT FOR THE PROCESS FOREMAN—98

Natural and Forced-Draft Tower Operation



NATURAL-DRAFT cooling tower. Fig. 5.



FORCED-DRAFT cooling tower (right). Fig. 6.

NATURAL-DRAFT towers operate in the same way as a furnace chimney. Air is heated in the tower by the hot water it contacts, so that its density or weight per cubic foot is lowered. The difference between the density of air in the tower and outside causes a natural flow of cold air at the bottom and the rejection of less dense, warm air at the top. Natural-draft towers must be tall for sufficient draft (Fig. 5).

A forced-draft cooling tower (Fig. 6) is a mechanical-draft tower in which the fan is located at the air inlet or base of the tower and is forced upward through the top at low velocity. They (and the induced-draft type) may be single cell or multiple cell (a battery of cooling towers). A cell is a complete unit in itself consisting of a fan, shell, partition, distribution system, packing, foundation, etc., and often provided with an individual water pump, etc. In a multicell tower, the cells can be operated independently or in groups. Often, the fan in this type of tower is belt driven.

This tower has certain advantages over the induced draft such as:

1. Easier maintenance.
2. Lighter tower construction.
3. More suitable for corrosive waters.
4. Affords better accessibility to fans which are located near ground level on a rigid foundation.

The air in a mechanical-draft tower is in contact with the hottest water just before leaving the tower. This permits the water to be cooled with a lower volume of air than would be required by a natural-draft cooling tower.

An objection, however, is that it is more likely than the induced type to recirculate the hot exhaust vapors. This occurs under certain atmospheric conditions because the velocity of the exhaust air is so low that the suction induced by the fans tends to draw it back into the tower.

An induced-draft cooling tower is a mechanical-draft tower having one or more fans installed at the air outlet of the tower and consists of a vertical shell, made of wood and a water distribution system, etc., similar to the forced-draft tower.

1. Counterflow (conventional type):

The fan is located in the top to provide air movement across the filling and is discharged at high velocity in an effort to achieve a larger degree of safety against recirculation of hot air.

Most induced-draft cooling towers are equipped with a right-angle speed-reduction gear. These gears are normally of two general types:

1. Worm, or
2. Spiral bevel (transmit power at an angle).

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.

Using Electronic Computers in the Oil Industry

Designing Refinery Water Networks

By Robert L. McIntire
The Datics Corp.

PETROLEUM plants are expanding. New plants are being built. Each such addition represents new budget problems to the top management of the petroleum company and a water-network-analysis problem to the design engineering department.

When a completely new plant is being designed, the engineers have an opportunity to lay their water supply lines in the plant in a fairly logical arrangement. Some pilot plants which have been visited by the author represent nearly the ultimate in planning and construction. When older plants are being expanded or revised, however, the total available budget usually precludes any radical revision in the water-supply network.

Regardless of the limitations, the new design will always place revised demands on the water supply. The safety engineer must approve the design in terms of being able to deliver very large quantities of water at sufficient pressure in cases of emergency. The process engineer must anticipate the water needs of his process for months (or years) to come. Additionally, the existing units in the area must be serviced. All of these demands could result in a maze of pipes each capable of carrying water in two directions. It is the responsibility of the engineering department to size and locate the lines within the network.

In the past, this problem has been solved by municipal consulting engineers—using sometimes an analogue computer known as the McIlroy Pipeline Analyzer.[1] This latter machine simulated the flow of water in the pipelines by electrical current flowing through resistor terminals. These resistor terminals consisted simply of modified light bulbs known as Fluistors. An appropriate Fluistor was chosen to be proportional to the resistance to flow in the pipeline due to the pipeline length, smoothness, and diameter.

Electronic digital computers can be used for the solution of the same problem. One such program was recently devised for the I.B.M. 650 magnetic-drum calculator.[2] This program uses the well-known Hazen-Williams hydraulic expression for the loss of head in any one pipe line:

$$H = K\,Q^{1.85} \qquad (1)$$

where:

H = head loss
Q = volume rate of flow
K = resistance factor

The value of K is determined from a table of such values depending on the pipeline length, the pipe diameter, and the Hazen-Williams coefficient, C. K can be calculated by the expression:

$$K = \frac{5{,}830\,L}{D^{4.87}\,C^{1.85}} \qquad (2)$$

These equations were woven into a computational method devised by Hardy Cross.[3] The result is a computer program which can determine the quantity of flow in any network line, the direction of flow in the same line, and the head loss at all points in the system. The program is capable of handling systems of up to 50 loops with a maximum of 10 lines within any one loop without further modification.

Although this computer program will not tell the engineering department where to place water lines in any new plant design, it can tell them what will be the result of placing them in any given configuration. Here again the computer is a tool for the engineer to use for paper experimentation.

With a given proposed system, we can pretend that an exceptionally heavy demand for water exists in a distant location in the plant. The computer will print results showing how that demand is satisfied and at what pressure it is delivered. These results may indicate that an extra loop needs to be laid or that the size of a new line needs to be increased. In exceptional cases, an elevated tank may solve the problem by supplying an additional pressure supply nearer to the expected demand location.

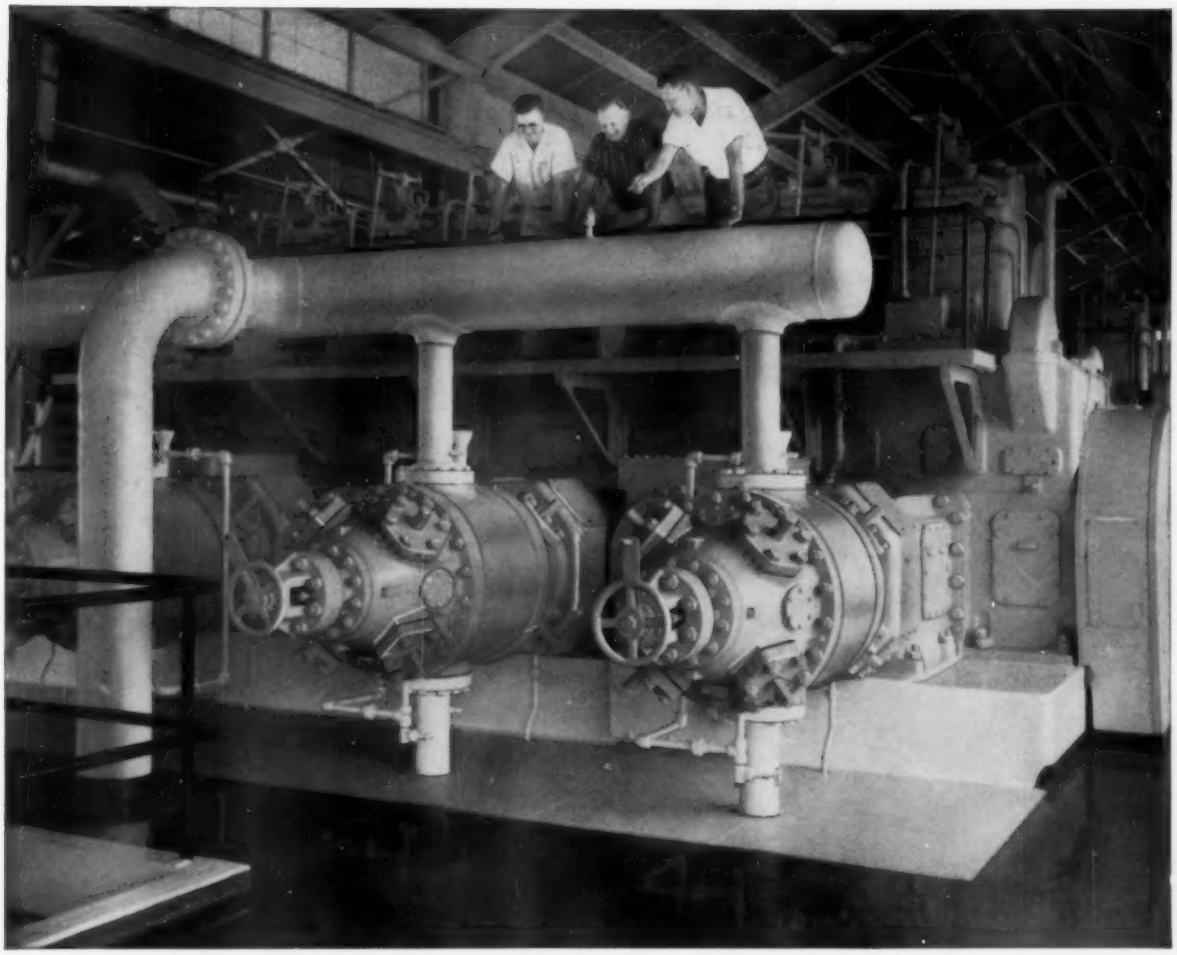
Each of these alternatives can be given to the electronic computer for analysis and, within an hour, the answer can be printed. In one day, an entire water distribution system design can be evaluated and modified.

The same program can be used for studying steam-distribution lines within a refinery or chemical plant. Provided the proper coefficient of resistance is chosen, the solutions are valid for any fluid flowing at steady state under conditions of turbulent flow.

With this new tool available, the costs associated with pipeline-network designs within new plants (both dollarwise and mantimewise) can be greatly reduced.

References

1. McIlroy, J., American Water Works Association, 42, No. 4 (1950).
2. Vinson, The DATICS Corp., Fort Worth, Tex. (1957).
3. Cross, The University of Illinois (1936).



Richard N. Rogers, Results Engineer (left), W. C. Drienhofer, Station Superintendent, and R. A. Cuyler, Jr., Gulf Sales Engineer, inspect one of the 31 units lubricated by Gulf Security since 1944.

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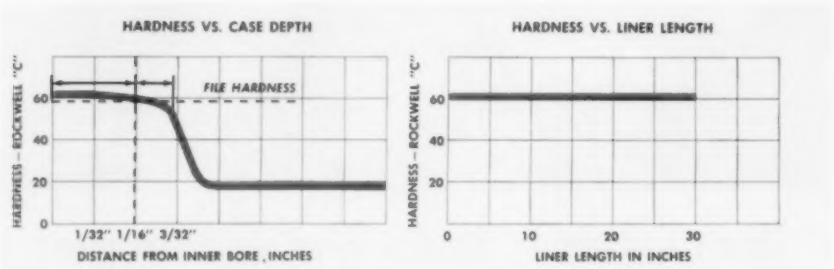

This graph shows that Mission Liners have a true "File Hard" bore throughout the useful wearing depth of 1/16". This means long liner life.

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Pipeline Patrol

...Report on Construction

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way.

U.S. Crude-Oil Pipelines

• **Cape Pipe Line Co.** (Sun Oil Co., Cities Service Co., Atlantic Refining Co.)
Project: Line from lower Delaware Bay to Philadelphia.
Status: Long range plans.
Completion: 1960.

• **C.A.T.C.** (Continental, Atlantic, Tidewater, Cities Service Production)
Project: 19 miles of 12-in. from Grand Isle, La., to Platform A in Block 47 field in Gulf of Mexico, plus four 5-mile sections of 8-in. to three other platforms in Block 47 and one in Block 40.
Status: Under way.
Contractor: **Marine Gathering Corp.**
Completion: September 1, 1957.

• **Four Corners Pipe Line Co.** (Shell, Standard of Calif., Continental, Gulf, Richfield, Superior)
Project: 635 miles of 16-in. from Aneth field in southern Utah to Los Angeles, 86 miles of 12-in. from New Mexico's Bisti field to Red Mesa station 35 miles southeast of Bluff, Utah, and 3 miles of 6, 8, 10-in. feeder lines from other fields in New Mexico and Utah. Will be operated by Shell Pipe Line.
Status: Under way.
Contractor: **A. P. Vaughn Construction Co.** and **Potashnick Construction Co.** have 170 miles of 16-in. from Aneth field to Cameron, Ariz. **R. H. Fulton Construction Co.** has 98 miles of 16-in. from Cameron to Seligman, Ariz., and 217 miles of 16-in. from the Colorado River to Olive, Calif.
Completion: End 1957.

• **Fulton, R. H. & Co.,** Lubbock, Tex.
Project: 39 miles of 6-in. in Wyo., from Donkey Creek field to Osage pump station in Weston County.
Status: Fulton, a contractor, has applied to Wyoming Public Service Commission.

• **Great Northern Railway Co.**
Project: 400 to 600 miles of 12 to 20-in. from Williston basin in Montana and North Dakota, to Clearbrook or St. Paul, Minn.
Status: Under study.
Contractor: **Pipe Line Technologists, Inc.** has contract for feasibility study to be finished July or August 1957.

• **Interstate Oil Pipe Line Co.**
Project: 5 miles of 4-in. from South Bosco field, and 5 miles of various size from Church Point field, La., to present main line.
Status: Proposed.

• **Magnolia Pipe Line Co.**
Project: 24 miles of 20-in., 20 miles of 12-in., 83 miles of 16-in. from Corsicana to Clyde, Tex.
Status: Under way.
Contractor: **H. B. Zachry Co.**
Completion: November 1, 1957.
Project: 120 miles of 16-in., 4 miles of 12-in. from Clyde to Midland, Tex.
Status: To start September 15, 1957.
Contractor: **O. R. Burden Construction Corp.**
Completion: December 31, 1957.

• **Muskegon Pipe Line Corp.** (Aurora Gasoline Co., Service Pipe Line Co.)
Project: 165 miles of 10-in. from Griffith, Ind., to Muskegon, Mich.
Status: Under way.
Contractor: **Midwestern Constructors, Inc.**
Completion: Late 1957.

• **Northwest Pipeline Corp.**
Project 80 miles of 8-in. and 300 miles of 10-in. crude and products line from Four Corners area to Salt Lake City.
Status: Proposed.

• **Offshore Gathering Corp., Houston.**
Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana. (Dual line.)
Status: Proposed.

• **Oil Field Pipe Line, Inc.**
Project: 200 miles 8 and 12-in. line from near Elkhart, to Ellinwood, Kans.
Status: Proposed.

• **Pasotex Pipe Line Co.**
Project: 58 miles of 20-in. between Wink and El Paso, Tex.
Status: Under way.
Contractor: **R. H. Fulton & Co.**
Completion: September 1, 1957.

• **Salt Lake Pipe Line Co.**
Project: 93 miles of 10-in. loops from Rangely, Colo., to Salt Lake City.
Status: Under way.
Contractor: **Engineers Pipeline Co., Ltd.**
Completion: December 1, 1957.

• **Shell Oil Co.**
Project: Undetermined length of 3, 4-in. in South Louisiana.
Status: Under way.
Contractor: **Brown & Root, Inc., W. P. Stanley,** spread superintendent, office at Buras, La.
Completion: September 30, 1957.

• **Sinclair Pipeline Co.**
Project: 150 miles of 20-in. from Teague, Tex., to Houston.
Status: Planned for 1958.
Completion: 1958.

• **Skelly Oil Co.**
Project: 38 miles of 8-in. extension of its gathering system into southern Kiowa County, Kansas.
Status: Planned.
Completion: Early fall 1957.

• **Southern Kansas Pipeline, Inc.**
Project: 200 miles of 6 to 10-in. in Kans. from southwestern Meade County to 10 miles north of Arkansas City.
Status: Proposed. Request filed with Kansas Corporation Commission for permit.

• **Tecumseh Pipe Line System** (Sinclair Pipe Line, Ashland, Pure)
Project: 201 miles of 20-in. between Griffith, Ind., and Cygnet, Ohio.
Status: Under way.
Contractor: **O. R. Burden Construction Corp.** and **Morrison Construction Co.**
Completion: September 1957.

• **Texas-New Mexico Pipe Line Co.** (Sinclair, Texas Co., Tidewater, Empire)
Project: 515 miles of 16-in. from southeast corner of Utah to Jal, N. M.
Status: To start late 1957.
Contractor: Survey contracts went to **J. V. McCoy,** Houston, and **E. H. Schmidt and Associates,** Tulsa.
Completion: 1958.

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Pipeline Patrol

U.S. Products Pipelines

• **Alaska-Yukon Refiners & Distributors, Ltd.**
Project: Two lines: one 150 miles from Haines to Haines Junction, Alaska, linking with government Canol line; another from Tok Junction, on Canol line, to Anchorage.
Status: Proposed.
Completion: 1959.

• **American Pipe Line Co.**
Project: Line from Gulf Coast to New York City. Has ODM approval to amortize 40 per cent of cost with fast writeoff.
Status: Proposed.

• **Buckeye Pipe Line Co.**
Project: Conversion of 32 miles of 8-in. between Mantua and Youngstown, Ohio.
Status: Planned.
Contractor: Company will do own work.
Completion: November 1957.
Project: 70 miles of 8-in. from Wayne to vicinity of Durand, Mich.
Status: Under way.
Completion: Early 1958.
Project: 60 miles of 10-in. from Port Everglades, Fla., to Miami's International Airport.
Status: Under way.
Contractor: Buckeye will do own work.

• **Cities Service Pipe Line Co.**
Project: 30 miles of 6-in. ethylene line from Lake Charles, La., to Orange, Tex.
Status: Under way.
Completion: October 1, 1957.
Project: 168 miles of 6-in. L.P.G. line from East Chicago, Ind., to Lowell, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.** has 98 miles from Lowell to South Bend, Ind., Robert Hively, spread superintendent, office at Ada, Mich.
Completion: September 1, 1957.

• **Continental Pipe Line Co.**
Project: Conversion of 99 miles of 6-in from the Wichita Falls area to near Fort Worth, Tex., plus a 15-mile extension to the Grapevine area northeast of Fort Worth.
Status: Conversion under way. Extension planned.

• **El Paso Natural Gas Co.**
Project: 11 miles of 4-in. L.P.G. from Snyder Line to South Andrews Plant, Tex.
Status: Planned.
Project: 240 miles of 6-in. from Odessa to El, Paso, Tex.
Status: Planned.
Contractor: **Pipeline Engineering Co.** has design and engineering contract. **Coates Field Service, Inc.** has right-of-way acquisition and claims settlement contracts.
Completion: Early 1958.

• **Florida Pipeline & Storage Co.**
Project: 67 miles from Everglades, Fla., to Homestead Air Force Base south of Miami.
Status: Under way.
Contractor: **Fish Service Corp.**
Completion: December 1957.

• **Great Lakes Pipe Line Co.**
Project: 93 miles of 8-in. from south of St. Paul to Eau Claire, Wis.; 68 miles of 12-in. from Great Lakes intersecting poin: with Badger Pipe Line to Chicago.
Status: Under way.
Contractor: **R. H. Fulton & Co.** has the 8-in. **Midwestern Contractors, Inc.** has the 12-in.
Completion: Late 1957.
Project: 15 miles of 6-in. from Lincoln, Neb., to Lincoln air base.
Project: 140 miles of 8-in. from Minneapolis to Superior terminals.
Status: To start September 1, 1957.
Contractor: **Laco Pipeline Contractors, Inc.**
Project: 34 miles of 12-in. from Tulsa to Barnsdall, Okla., replacing 12, 8-in. lines.
Contractor: **Midwestern Constructors, Inc.**
Completion: Late 1957.
Project: 14 miles of 8-in. from Coffeyville to Independence, Kans., replacing 4-in. line.
Contractor: **Jess Whitlow Pipe Line Service.**
Project: 11 miles of 8-in. from 10 miles east of Donahue, Iowa, to terminals at Bettendorf, Iowa.
Contractor: **R. T. Perry Pipe Line Construction.**

• **Laurel Pipeline Co.** (Gulf Refining Co., Sinclair Pipe Line Co., The Texas Co.)
Project: 100 miles of 24-in. and 340 miles of line graduating down to 14-in. at the west terminus, from Philadelphia to Cleveland.
Status: To start early 1958.
Completion: 1958.

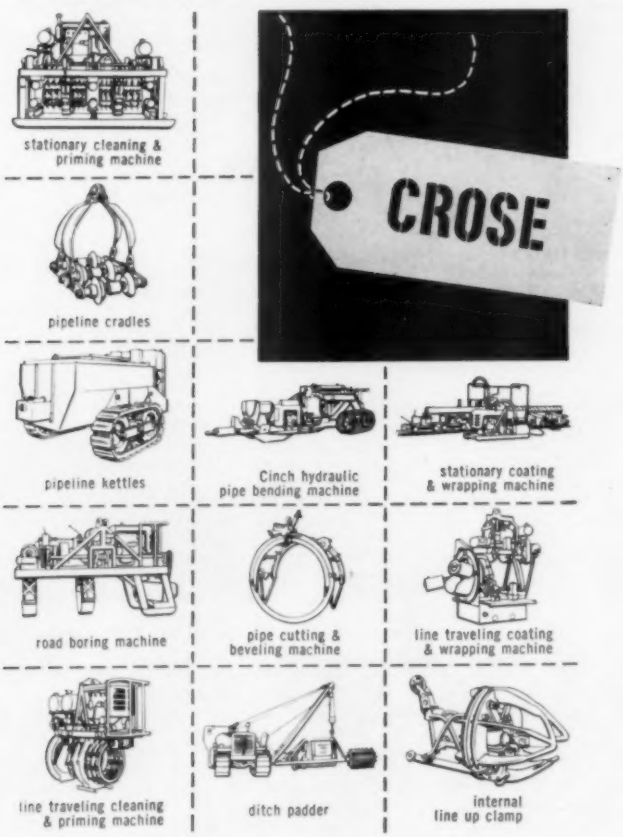
• **Leonard Refineries, Inc.**
Project: 43-mile line from Alma to Lansing, Mich.
Status: Planned.

• **Northwest Pipeline Corp.**
Project: 80 miles of 8-in. and 300 miles of 10-in. products and crude line from Four Corners area to Salt Lake City.
Status: Proposed.

• **Odessa Butadiene Co.**
Project: 240 miles of 6-in. from Odessa to El Paso, Tex.
Status: Planned.
Completion: March 1, 1958.

• **Ohio Oil Co.**
Project: 350-miles of 12-in. from Wood River, Ill., to Chicago.
Status: Work to start fall 1957.
Completion: 1958.

• **Salt Lake Pipe Line Co.**
Project: 80 miles of 8-in. loops from Adams to Ontario, Ore.
Status: Under way.
Contractor: **Hallmac Construction Co.**



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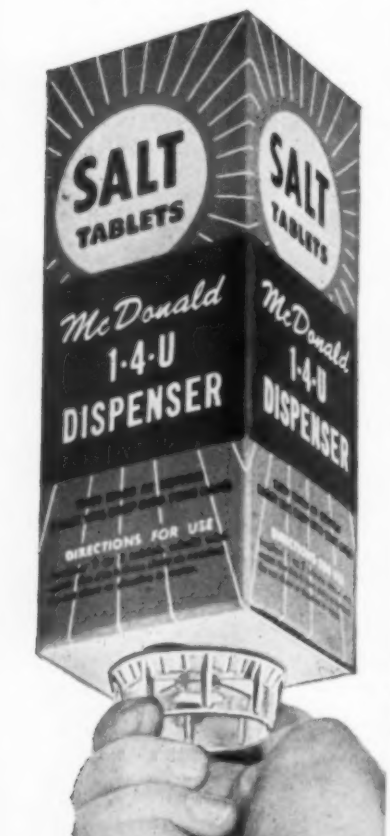

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Completion: December 1, 1957.

• **Southern Pacific Pipe Lines, Inc.**
Project: 100 miles of 10-in., 80 miles of 8-in., and 125 miles of 6-in. between Richmond, Calif., and Fallon, Nev.
Status: Under way.
Contractor: **River Construction Corp.** has 84 miles of 8, 10-in. from Richmond to Stockton, Calif., completed. **Hood Construction Co.** has 58 miles of 10-in. from Lodi to Roseville, Calif., completed. **Engineers, Limited Pipeline Co.** and **Joe E. Young Pipe Line Construction Co.** have 180 miles of 6 and 8-in. between Rocklin, Calif., and Fallon, Nev.
Completion: September 1, 1957.

• **Texas Eastern Transmission Corp.**
Project: 1,168 miles of 20-in. from Baytown, Tex., to Moundsville, W. Va., conversion from gas.
Status: Under way.
Completion: September 1, 1957.
Project: 231 miles of 14-in. from Seymour, Ind., to Chicago.
Status: Under way.
Completion: Fall 1957.

• **Trust Pipe Line Co.** (Cosden Petroleum)
Project: 128 miles of 6-in. from Hawley, near Abilene, to Wichita Falls, Tex.
Status: Under way.
Contractor: **Holder Construction Co.**
Completion: October 1957.

• **Underground Storage & Exploration, Inc.**
Project: 393 miles of 12-in. L.P.G. line from Moundsville, W. Va., to Newark, N. J., plus 95 miles of 6, 8-in. laterals to Mauch Chunk, Pa., and to Philadelphia.
Status: Proposed.

• **Union Oil Co. of California**
Project: 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its Rifle shale-oil plant.
Status: Proposed.

U.S. Natural-Gas Pipelines

• **Arkansas Louisiana Gas Co.**
Project: A 300-mile line, plus gathering lines, from Tex.-La. coastal area to northern La., to connect with present system.
Status: Long-range plans.

• **Atlantic Seaboard Corp.**
Project: 14 miles of 26-in. looping in Hardy and Randolph counties, West Virginia.
Status: Has temporary FPC approval.

• **Carolina Pipeline Co.**
Project: 177 miles of 2, 3, 4, 6, 8, and 10-in. between Blacksburg and Camden, S. C.
Status: Under way.
Contractor: **Panama-Williams Corp.** has construction contract. **Coates Field Service, Inc.** has right-of-way acquisition and claims settlement contract.

• **Central Hudson Gas & Electric Corp.**
Project: 46 miles of 10-in. from Albany to Kingston, N. Y.
Status: Under way.
Contractor: **Williams-Austin Construction Corp.**, O. L. Martin and Ralph Gaddy, supts., office at Catskill, N. Y.
Completion: December 1, 1957.

• **Cities Service Gas Co.**
Project: 8 miles of 16-in., 20 miles of 8-in., 20 miles of 6-in., and 20 miles of 4-in. field lines in Barber County, Kansas.
Status: Approved. Under way.
Contractor: **Vaughn & Taylor Construction Co.**
Project: 3 miles of 12-in., 8 miles of 10-in., 4 miles of 8-in., 8 miles of 6-in., and 37 miles of 4-in. field lines in Eureka Field, Okla.
Status: Approved. Under way.
Contractor: **Prairie Construction Co.**
Project. 64 miles of 6 to 30-in. in Leavenworth and Anderson counties, Kans., Cass County, Mo., and Oklahoma County, Okla.
Status: Planned.
Project: 75 miles of 30-in. from Independence to near Welda, Kan.
Status: Pending FPC approval.

Pipeline Patrol

Project: 7 miles of 30-in. from Merriam to Kansas City, Kans.
Status: Under way.
Contractor: **Prairie Construction Co., Inc.**
Completion: September 15, 1957.

• **Coastal States Gas Producing Co.**
Project: A 20-mile gathering system from the Rock Island area of Colorado County, Tex., to the United Gas Corp. system.

• **Coastal Transmission Corp.**
Project: 575 miles of 12, 20, 22, 24-in. main line and 414 miles of 2 to 14-in. gathering lines between McAllen, Tex., and Baton Rouge, La.
Status: Under way.
Completion: January 1, 1958.

• **Colonial Natural Gas Corp.**
Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.
Status: Proposed.

• **Colorado Interstate Gas Co.**
Project: 1957 program . . . 66 miles of 30-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pueblo, Colo; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 50 miles of 22-in. from Laverne to Hooker, Okla.; 24 miles of 22-in. Panhandle field looping.
Status: Pending FPC approval. Has temporary approval for the 50 miles in Okla.

• **Eastern Shore Natural Gas Co.**
Project: 34 miles of 8-in. and 90 miles of 6-in. from connection with Transcontinental Gas Pipe Line Corp. in Maryland, across entire length of Delaware to Salisbury.
Status: Pending FPC approval.

• **East Ohio Gas Co.**
Project: 90 miles of 24-in., and 23 miles of 30-in. from Richfield to Summerfield, Ohio.
Contractor: **Sharman, Allen, Gay & Taylor, Inc.**, James Adams, spread superintendent, office at Wadsworth, Ohio. **Coates Field Service, Inc.** has right-of-way acquisition and claims settlement contract.
Completion: November 1957.

• **Edison Securities Co.**
Project: 130 miles of 30-in. from San Joaquin Valley fields to Wilmington, Calif.
Status: Being contested by Southern California Gas Co., Southern Counties Gas Co., and Pacific Lighting Gas Supply Co.
Contractor: **Bechtel Corp.**

• **El Paso Natural Gas Co.**
Project: 27 miles of 34-in. San Juan main line loops.
Status: Under way.
Completion: September 1957.
Project: 81 miles of 18-in. and 13 miles of 20-in. from Panoma Plant, Gray County, to Dumas Plant, Moore County, Texas.
Status: Under way.
Contractor: **R. H. Fulton & Co. Coates Field Service, Inc.** has right-of-way acquisition and claims settlement contract.
Completion: November 1, 1957.
Project: 177 miles of 20-in. from Sonora Plant, Sutton County, to Plains Plant, Yoakum County, Texas.
Status: Planned. Filed for FPC permit.
Completion: January 1958.
Project: 74 miles of 30-in. Permian-San Juan main line loops.
Status: Planned. Filed for FPC permit.
Completion: January 1958.
Project: 216 miles of 6 to 34-in. and 533 miles of various size in Ariz., Tex., N. M.
Status: Filed for FPC permit.
Project: 47 miles of 30-in. from proposed Lindrith, N. M., plant to proposed Chaco, N. M., plant.
Status: Under way.

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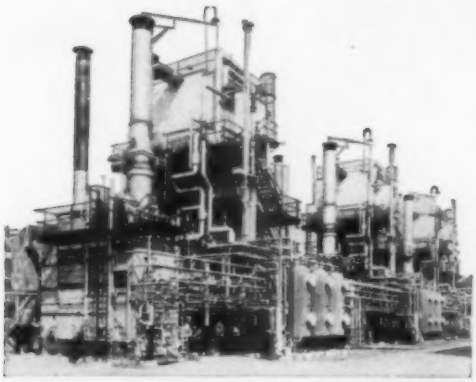

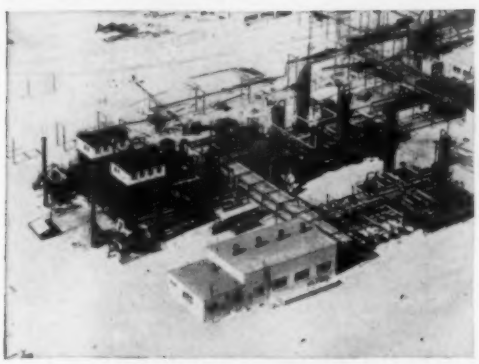

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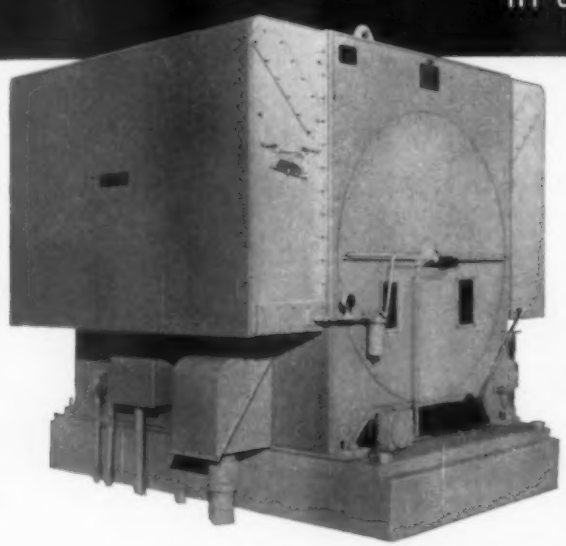

This Elliott 1250-hp, 2-pole, squirrel-cage induction motor, originally round frame as below, is one of the three motors which was rebuilt for year 'round weather protection. All four Elliott motors at the Laura Station are direct-connected to the oil pumps.

One of the three Elliott round-frame motors as it appeared originally.

Costs Are Slashed. The outdoor structure costs far less and maintenance as well as year 'round operating costs are reduced. Besides that, Elliott motors are especially designed for safe, dependable, trouble-free operation *in all kinds of weather.*

Take the case of the Service Pipeline Company in Illinois. Rebuilding the above Laura Station as an outdoor facility, this company installed four Elliott weather-protected squirrel-cage induction motors. The station includes a canopy which gives extra protection from rain and sun—added insurance against the possibility of direct sunlight tripping the thermal devices, and provides a chain hoist for maintenance. Both the concrete slab area and the canopy extend far enough to provide ample working space around pumping units.

Three of the four motors, originally dripproof round-frame, were rebuilt to weather-protected designs—resulting in additional savings. Windings were given added treatment by immersing coil ends and baking. Explosion-proof bearing temperature and oil pressure relays were provided to assure maximum safety for operation in a hazardous atmosphere. These and other features of the Elliott weather-protected motors permit the erection of simplified outdoor stations instead of more costly enclosed housings. For further details, call your nearby Elliott District Office or write . . .

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R7-1

Pipeline Patrol

Contractor: **Foutz & Bursum Construction Co.**

Completion: 1957.

Project: 38 miles of various size line to make additional gas available at the McElroy-Wilshire plant near Crane, Tex.

• **Houston Texas Gas & Oil Corp.**

Project: 702 miles of 24-in. from Baton Rouge, La., to Kissimmee, Fla.; 240 miles of 18-in. from Kissimmee to Cutler, Fla.; 642 miles of 3 to 18-in. sales laterals in Florida. Main line to join Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.

Status: Under way.

Contractor: **Midwestern Constructors** has the 702 miles of 24-in.; **Harbert Construction Corp.** has remainder.

Completion: June 1958.

• **Illinois Power Co.**

Project: 6 miles of 6-in. line between Hoffman and Carlyle, Ill., plus distribution lines.

Status: Under way.

Contractor: **Mid-States Construction Co.,** H. A. Hane, supt., office at Carlyle, Ill.

Completion: September 1, 1957.

• **Intermountain Gas Co.**

Project: 16 miles of 6-in. from Payette to Weister, Ida.

Contractor: **Hood Construction Co.,** V. H. Bailey, supt., office at Payette.

Completion: September 15, 1957.

Project: 16 miles of 6-in. near Mountain Home, Ida.

Contractor: **Hood Construction Co.,** Sam Shearman, supt., office at Boise.

Completion: September 1, 1957.

• **Iron Ranges Natural Gas Co., St. Paul.**

Project: 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minn.

Status: Application pending with FPC.

• **Kansas-Nebraska Natural Gas Co.**

Project: 61 miles of various size gathering line in Camerick field, Texas County, Okla.

Status: Approved.

• **Manufacturers Light & Heat Co.**

Project: 50 miles of 10, 12-in. from Waynesburg to Pittsburgh, Pa.; 40 miles of 16-in. and 20 miles of 6 to 12-in. from Corning to Dundee, N. Y.

Status: Under way.

Contractor: **Harford Brothers,** A. M. Harford and Robert Mann, superintendents.

Completion: September 15, 1957.

• **Michigan Consolidated Gas Co.**

Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.

Status: Under way.

Contractor: **Somerville Construction Co.;** Floyd Huduall, supt., office at Cadillac, Mich.

Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.

Status: Under way.

Contractor: **Somerville Construction Co., jointly with J. L. Gentry Construction; Frank** Morris, superintendent, office at Hart, Mich.

• **Michigan Wisconsin Pipe Line Co.**

Project: 46 miles of 24-in. looping of Wisc. main line.

Status: Under way.

Contractor: **G. E. T. Construction, Inc.**

Completion: September 1, 1957.

Project: 21 miles of 4, 6, 12-in. laterals in Wisc., Mich., Mo.

Status: Approved.

Contractor: Various.

Completion: September 1, 1957.

• **Midwestern Gas Transmission Co.**

Project: Will build main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in., plus 648 miles of 3 to 18-in. extensions in Minn. and Wis.

Status: Application pending with FPC.

• **Mississippi River Fuel Corp.**

Project: 54 miles of 26-in. loops in La., Mo., Ark.

Status: Pending with FPC.

• **Montana-Dakota Utilities Co.**

Project: 28 miles of 12-in. from Fallon County to Dawson County, Montana.

Status: Approved.

Project: 6 miles of 12-in. between Mandan and Bismarck, N. D.

Status: Has temporary approval.

• **Mountain Fuel Supply Co., Salt Lake City.**

Project: 38 miles of 20-in. to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.

Status: Approved.

Project: Extension of 12-in. line from Ogden to Logan and Brigham City, Utah.

Status: Has applied to Utah Public Service Commission.

Completion: Late 1957.

• **Natural Gas Pipeline Co. of America**

Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex., plus a gathering system.

Status: Under way.

Contractor: **R. H. Fulton & Co.** has Red River crossing in northern Montague County. **Fulton & Brodie, Inc.,** Lubbock, Tex., has gathering system. **Eastern Pipeline Contractors,** Dallas, has 80 miles of 20-in. from Bridgeport, Tex., to Healdton, Okla. **River Construction Corp.** has 173 miles from Mountain View, Okla., to Fritch, Tex. **H. B. Zachry Co.** has 87 miles of 26-in. between Healdton and Mountain View, Okla.

Completion: January 1, 1958.

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Pipeline Patrol

Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and 91 miles of 30-in. loops along parts of its main line.

Status: Application pending with FPC.

Project: 337 miles of 30-in. between Fritch, Tex., and Beatrice, Neb., and 59 miles of 36-in. between Beatrice and Joilet, Ill., along existing system.

Status: Pending FPC approval.

Completion: 1959.

• **New York State Natural Gas Corp.**

Project: 15 miles of 30-in. from Horseheads to Newfield, N. Y.; 31 miles of 20-in. from Harrison to Woodhull, N. Y.; 10 miles of 12-in. from Stockbridge to Oneida, N. Y.

Status: Planned.

Project: 12 miles of 12-in. near Oneida, N. Y.

Status: To start September 15, 1957.

Contractor: **Harford Brothers**, A. M. Harford and Robert Mann, superintendents.

Completion: October 15, 1957.

• **Niagara Mohawk Power Corp.**

Project: 14 miles of 18-in. from Phoenix to Palermo, N. Y.

Status: Planned.

Completion: October 1, 1957.

Project: 261 miles of 2 to 16-in. transmission and distribution mains to service areas in central, eastern and northern New York.

Status: Planned.

Contractor: Various.

Completion: December 31, 1957.

• **North Carolina Natural Gas Corp.**

Project: 630 miles of 2 to 16-in. from near Mooresville, eastwardly across N. C.

Status: To start fall 1957.

Completion: Spring 1958.

• **Northern Natural Gas Co.**

Project: 160 miles of 2, 3, 6, 8-in. branch lines to serve 20 new communities on Aberdeen, S. D., line.

Status: Under way.

Contractor: **Troth Construction Co.**

Project: 73 miles of 20-in. from Savana Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.

Status: Planned.

Project: 365 miles of main line and 1,090 miles of branch lines to serve communities in Minn., Iowa, S. D., Nebr., Wis.

Status: Filed with FPC March 18, 1957.

Project: 13 miles of 16-in. to replace existing 10-in. line in Hansford County, Texas.

Status: Has temporary FPC authority.

• **Offshore Gathering Corp.**, Houston.

Project: 364 miles in Gulf of Mexico off Louisiana: 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in. (Dual line.)

Status: Application pending with FPC.

• **Ohio Fuel Gas Co.**

Project: 11 miles of 18-in. and 11 miles of 20-in. from Gibsonburg, Ohio to Toledo; and 30 miles of 24-in. looping from Pavonia to Attica, Ohio.

Status: Pending FPC approval.

Contractor: **H. L. Gentry Construction Co.** has the 18 and 20-in.

Completion: Gentry work to be completed September 20; remainder November 25, 1957.

Project: 152 miles of line in Ohio: 43 miles of 24-in. from Crawford Station to Utica; 18 miles of 24-in. from Pavonia Station to Line D; 6 miles of 20-in. from Mount Gilead to Claridon; 4 miles of 20-in. near Dayton; 4 miles of 20-in. near South Charleston; 7 miles of 16-in. near Springfield; 6 miles of 20-in. nnear Oberlin; 17 miles of 20-in. from Oak Hill to Symmes Station; 7 miles of 12-in. from Mount Sterling to Bloomingburg; 2 miles of 8-in. near Bellefontaine; 3 miles of 12-in. near Mansfield; 4 miles of 12-in. near Lakeville; 7 miles of 8-in. in Guernsey and Belmont counties.

Status: Under way.

Contractor: **O. R. Burden Construction Corp.** has completed 43 miles of 24-in. from Sugar Grove near Crawford station, to Utica, Ohio, and has 27 miles of 20-in. south from Wellston to complete September 1, 1957.

• **Pacific Gas & Electric Co.**

Project: 138 miles of 34-in. looping of the Topock-Milpitas line.

Status: Under way.

Contractor: **Engineers Limited Pipeline Co.**

Completion: December 1, 1957.

Project: 5 miles of 16-in., 160 miles of 12-in., 8 miles of 6-in. from Corning to Eureka, Calif.

Status: Planned.

Contractor: **Engineers Limited Pipeline Co.** and **Alex Robertson Co.**

Completion: January 1, 1958.

Project: 13 miles of 12-in., 2 miles of 10-in., from Santa Cruz to Davenport, Calif.

Status: Planned.

Completion: October 1957.

Project: 1,300 miles of 36-in. from Alberta to San Francisco.

Status: Proposed.

• **Pacific Northwest Pipeline Corp.**

Project: 37 miles of 6-in. from Dove Creek to Nucla, Colo., and 13 miles of 4-in. from Nucla to Urvan, Colo.

Status: Has FPC permit.

Project: 1,000 miles of gathering lines and laterals along present line.

Status: Planned.

Completion: 1957.

Project: 35 miles of 4, 6-in. laterals from its 26-in. Shonohomish County, Wash., line to Grotto, Wash.; 5 miles of 3-in. lateral from its Urvan, Colo., lateral to Slick Rock, Colo.; 41 miles of 6-in. from its Coeur d'Alene lateral to near Kellogg, Idaho; 37 miles of 8-in. from Spokane to Moses Lake, Wash.

Status: Has temporary FPC approval.

• **Pennsylvania Gas Co.**

Project: 23 miles of 10-in. in Erie County, Pa., 15 miles of 8-in. in Warren and Chautauqua counties, Pa., 30 miles of branch lines, several small distribution lines.

Status: Has FPC permit.

• **Peoples Natural Gas Co.**

Project: 58 miles of 2 to 14-in. extension and replacement lines in Pennsylvania.

Status: Under way.

Completion: September 1957.

• **Permian Basin Pipeline Co.**

Project: 83 miles of 16-in. from its Spraberry station in Midland County, Tex., to tie in with Pioneer Gathering System, Inc. in northwestern Schleicher County, Tex.

Status: Has temporary FPC approval.

• **Phillips Petroleum Co.**

Project: 3 miles of 24-in. in Moore County, Texas.

Status: Planned.

Completion: October 1, 1957.

Project: 30 miles of 3 to 8-in. in Moore, Hutchinson, Sherman, Hansford, and Gray counties, Tex., and in Texas County, Okla.

Status: Planned.

Contractor: Various.

Completion: January 1, 1958.

• **Piedmont Gas Co.**

Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell and Burke counties.

Status: Has FPC approval.

• **Pioneer Gathering System, Inc.**

Project: 70 miles of mostly 16, 12-in. in Val Verde, Schleicher, Sutton counties, Tex.

Status: Under way.

Competion: Early fall 1957.

• **Signal Oil & Gas Co.**

Project: 80 miles of gathering lines to Tioga, N. D., gasoline plant from South Blue Buttes, Antelope, and North Blue Buttes, McKenzie County, N. D.

Status: Under way.

Contractor: **C. P. Bartley & Son.**

Completion: October 1, 1957.

• **Southern California Edison Co.**

Project: 200-mile line from San Joaquin Valley gas fields to Redondo Beach, Calif.

Status: Under way.

Completion: 1957.

• **Southern Natural Gas Co.**

Project: 10 miles of 8-in. laterals in Napoleonville Field and Fort Jackson Field, La.

Status: Has FPC approval.

Completion: December 1, 1957.

Project: 32 miles of 6-in. from Chandeleur Sound area, Breton Island, La.; 7 miles of 8-in. and 5 miles of 10-in. from Main Pass area to Olga, La.; 9 miles of 8-in. from Bastian Bay Field to Fort Jackson Field; 7 miles of 8-in. laterals in Manila Village Field.

Status: Has FPC approval.

Completion: December 1, 1957.

• **Spokane Natural Gas Co.**

Project: 400 miles of 1 through 24-in. distribution system at Spokane.

Status: Under way.

Contractor: **Hallmac Construction Co.**; V. L. Williams, supt., office at Spokane.

Completion: 1957.

• **Tennessee Gas Transmission Co.**

Project: 221 miles of 30-in., 101 miles of 26-in., and 10 miles of 24-in. looping from Portland, Tenn., to Greenup, Ky.; from Morehead, Ky., to Catlettsburg, Ky.; from Catlettsburg to Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from New Castle, Pa., to near Pittsburgh, Pa.

Status: Pending FPC approval.

Contractor: **Bechtel Corp.** has 24 miles of 30-in. from Olive Hill to Greenup, Ky., to complete August 3, 1957, M. A. (Slim) Roberts, supt., office at Grayson, Ky. **Oklahoma Pipe Line Constructors** has 35 miles of 30-in. in Ky., Gene Gohring, supt., office at Richmond.

Project: 51 miles of 26-in., 51 miles of 20-in., and 17 miles of 12-in. gathering lines from Kinder, La., to offshore fields in Gulf of Mexico.

Status: Has temporary FPC approval.

Project: 577 miles of 30-in. from Mississippi River delta area south of New Orleans to Portland, Tenn.

Status: Pending FPC approval.

Project: 76 miles of 24-in. between Coudersport, Pa., and Hamburg, N. Y.

Status: Pending FPC approval.

Project: 33 miles of 6, 8, 10-in. laterals in Southwest Pass area below New Orleans.

Contractor: **Houston Contracting Co.**, H. E. Murphy, supt., office at Venice.

• **Texas Eastern Transmission Corp.**

Project: 17 miles of 8-in. and 3 miles of 6-in. from its 20-in. Baytown-Hankamer line to Alco-Mag field in Harris County, Texas.

Status: Has FPC approval.

Project: 97 miles of 30-in. loops between Kosciusko, Miss., and Uniontown, Pa., and 40 miles of 10-in. laterals.

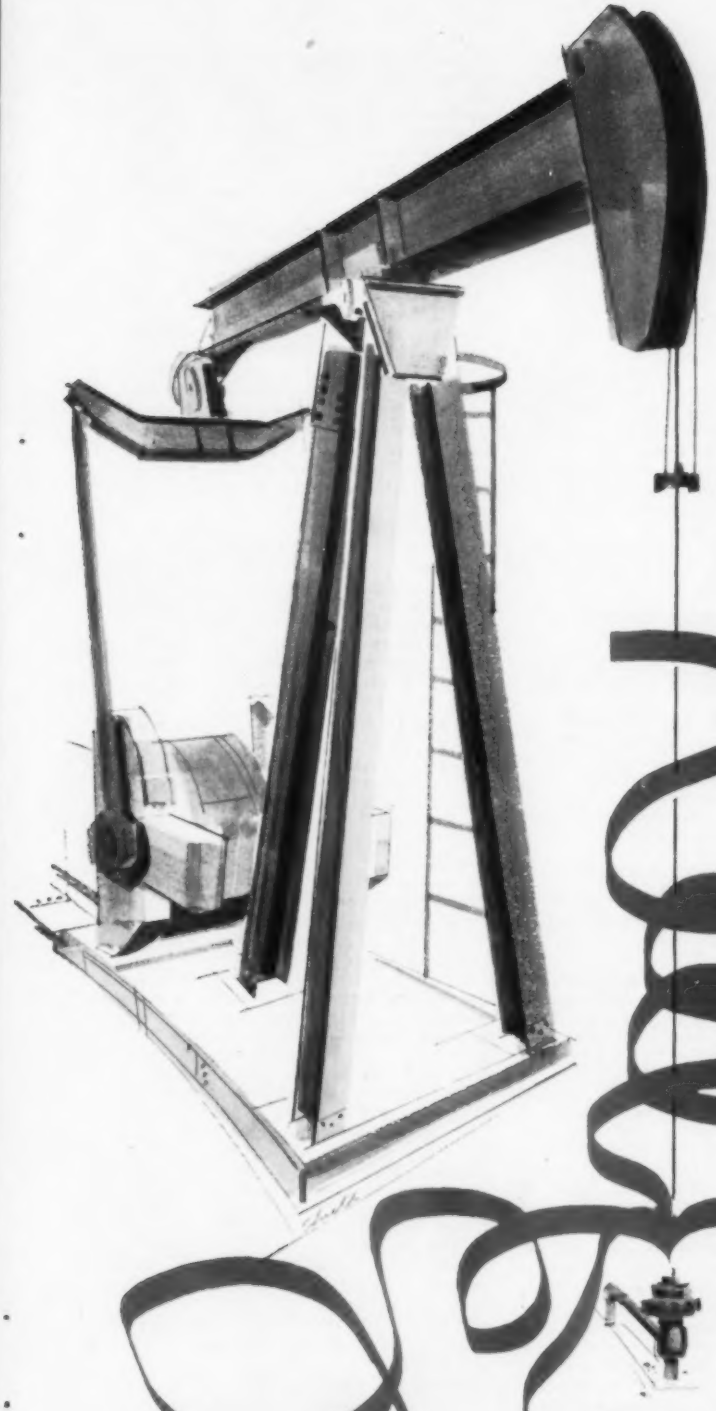
Status: Has FPC approval.

Completion: September 1, 1957.

Project: 667 miles of 30-in. from Kosciusko, Miss., to Uniontown, Pa.

Status: Under way.

Contractor: **H. C. Price Co.** (64 miles from Barton, Ala., to Mount Pleasant, Tenn.; 51 miles from Mount Pleasant to Gladeville, Tenn.; 52 miles from Gladeville to Tompkinsville, Ky.; 68 miles from Tompkinsville to Danville, Ky.; 63 miles from Danville to Owingsville; 46 miles from Owingsville to Wheelersburg, Ohio. Will use four spreads); **Williams Brothers Co.** (63 miles from Egypt, Miss., to Barton, Ala.; 64 miles from Berne, Ohio, to Uniontown, Pa.); **Houston Contract-**



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ing Co. (80 miles from Kosciusko to Egypt, Miss.; 57 miles from Wheelersburg to Athens, Ohio, W. H. Hayes, supt., office at Oak Hill; 61 miles from Athens to Berne, Ohio, R. E. Thornton, supt., office at Caldwell).

Completion: Fall 1957.

Project: 231 miles of 14-in from Seymour, Ind., to Chicago.

Status: Under way.

Contractor: **H. L. Gentry Construction Co.** has 84 miles from Seymour northeast. **Latex Construction Co.** has next 93 miles. **Western Pipeline, Inc.** has following 39 miles. **Missouri Valley Dredging Co.** has White River crossing. **Pentzien, Inc.** has Wabash and Kankakee crossing.

Completion: September 1957.

- **Texas Illinois Natural Gas Pipeline Co.**

Project: 10 miles of 36-in. to loop existing single 30-in. near Joliet, Ill.

Status: Has FPC approval.

- **Transcontinental Gas Pipe Line Corp.**

Project: 172 miles of 36-in., 68 miles of 30-in., 162 miles of 24-in., and 64 miles of smaller size loops from Tex. to N. J.

Status: Work in North Carolina under way.

Contractor: **Western Construction Co.** has 65 miles of 36-in. and 45 miles of 30-in. at scattered spots along system in S. C., N. C., Pa., and Va. Work will start in N. C., office at Winston-Salem.

Completion: December 1957.

Project: 110 miles of 36-in., 16 miles of 30-in., and 13 miles of 24-in. looping in S. Car., Ga., Ala., Miss., and La.

Status: Under way.

Contractor: **Sharman, Allen, Gay & Taylor, Inc.**, E. D. Singleton, superintendent.

Completion: November 1957.

Project: 57 miles of main line in La., Miss., Ala., Ga., S. C., and 247 miles of laterals in Tex. and La.

Status: Has temporary FPC approval.

- **Trans-Western Pipe Line Co.** (Warren Petroleum, Monterey Oil Co., J. B. Butler.)

Project: A line from Four Corners area to Calif. border.

Status: Proposed.

- **United Gas Pipe Line Co.**

Project: 40 miles of 8-in. from Baldwin County, Alabama, to Container Corp.'s plant.

Status: Has FPC permit.

- **Western Slope Gas Co.**

Project: 36 miles of 4-in. from Piceance Creek field in northwestern Colo., to Rifle, Colo.

Status: Under way.

Completion: October 1957.

Canadian Crude-Oil Pipelines

- **Act Oils, Ltd.**

Project: A 450-mile line from the Peace River region of northern B. C. to tidewater at Bella Coola, B. C.

Status: Request has been made for permit from the B. C. government.

- **B-A Alberta Pipe Line, Ltd.**

Project: 35 miles of 8-in. to connect Drumheller field, Alberta, with existing lines running to Edmonton.

Status: Pending approval.

- **Interprovincial Pipe Line Co.**

Project: 156 miles of 20-in. to extend present line from Sarnia to Port Credit, Ont.

Status: Under way.

Contractor: **Robert Somerville Co., Ltd.** and **Sheehan Constructors of Canada, Ltd.** have 90 miles from Sarnia to Bright, Ont., Jim Brown, supt., office at Strathroy.

Completion: September 1, 1957.

Project: 79 miles of 26-in. from Clearbrook Minn., to Superior, Wis.

Status: Under way.

Contractor: **R. H. Fulton & Co.**

Completion: August 31, 1957.

- **Pembina Pipe Line, Ltd.**

Project: 100 miles of 3 to 12-in. gathering line in Pembina oil field, Alta.

Contractor: **Universal Pipe Line, Ltd.**, subsidiary of Mannix, Ltd., T. Childress, spread superintendent, office at Drayton Valley, Alta.

Completion: November 1, 1957.

- **Royalite Oil Co., Ltd.**

Project: 250-mile line from Athabasca oil sands, northeastern Alta., to Edmonton.

Status: Long range plans.

Completion: 1960.

- **Westspur Pipe Line Co.**

Project: 20 miles of 12-in. from Alida in southeastern Saskatchewan, to the Carnduff-Glen Ewen area to tap Cantal, Hastings, Florence, Carnduff, and Glen-Ewen fields; 34 miles of 4, 6, 8-in. gathering lines.

Completion: River crossing completed. Total project to be completed in 1960.

Status: Has requested permit from Board of Transport Commissioners.

Contractor: **Majestic Contractors, Ltd.**, Jeff Minter, supt., office at Estevan, Sask.

Completion: No date set.

Canadian Products Pipelines

- **Hydrocarbons Pipeline Co.**

Project: 800 miles of 6 and 8-in. L.P.G line from near Edmonton, Alta., to Fort William, Ont.

Status: Has permit from Parliament of Canada. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start in 1957.

Construction consultants: **Dutton-Williams Brothers, Ltd.**, and **A. D. Little Co.**

Canadian Natural-Gas Pipelines

- **Alberta Gas Trunk Line Co., Ltd.**

Project: 637 miles of 34 to 16-in. gathering lines in Alberta.

Status: Under way.

Contractor: **Dutton-Williams Brothers, Ltd.** has preliminary studies, design and management-engineering. **Universal Pipe Line, Ltd.** subsidiary of Mannix, Ltd., jointly with **Marine Pipeline & Dredging Co.**, has crossing of Red Deer River near Cavendish, Alta., J Hysuick, spread superintendent, office at Empress. **Fulton Banister, Ltd.**, has 17 miles of 34-in. west from Burstall, Sask., to near Cavendish, Alta., and 100 miles of 18-in. north to Bindloss and Provost fields, George Caron, supt., office at Empress, Alta., to complete summer 1957.

- **Inland Natural Gas Co., Ltd.**

Project: 304 miles of mainline and 2" miles of laterals from Savona to Nelson B. C.: 150 miles of 12-in.; 112 miles of 10-in. 67 miles of 6-in. Also will build 400 miles of distribution piping in 31 towns.

Status: Under way.

Contractor: **Dutton-Williams Brothers, Ltd.** Pat Campbell, manager, office at Perticton.

Completion: October 1, 1957.

- **North Canadian Oils, Ltd.**

Project: 47-mile extension into Jasper, Alta., of its 10-in. line from Wabamun to Hinton west of Edmonton.

- **Northern Ontario Pipe Line Crown Corp.**

Project: 675 miles of 30-in. from the Ontario-Manitoba border to near Kapuskasing, Ont. (part of the 2,250-mile Trans-Canada line; will be leased to Trans-Canada Pipe Line Co. with option to buy.)

Status: 79-mile section from Stedman to Forham Township under way.

Contractor: **Dutton Williams Brothers** has 58 miles from the Manitoba-Ontario border west of Kenora to a point east of the crossing of Ontario Highway 17. **Morrison Shivers, Ltd.** has 94 miles from the east crossing of Highway 17 to a line separating the townships of Hyndman and Hodgson. **Majestic Contractors & Associates** has 80 miles from the Morrison Shivers terminal to Stedman Township. **Houston Contracting Co.** has 79 miles from Stedman to Forham Township, R. L. Silar, spread superintendent, office at Raith, Ont.

Contractor: **River Construction Corp.**, has Winnipeg River crossing near Kenora, Ont. to complete November 15, 1957.

Completion: End 1957.

- **Plains-Western Gas & Electric.**

Project: 25 miles of 10-in. from the Trans-Canada Pipe Line to Brandon, Manitoba.

Status: Under way.

Contractor: **Banister Construction, Ltd.**, Ole Johnson, superintendent.

Completion: September 1, 1957.

- **Provo Gas Producers, Ltd.**

Project: 22 miles of 3 to 12-in. gathering lines and wellhead tie-ins in Provost Field, Alta.

Status: Under way.

Contractor: **Fulton Banister, Ltd.**, Jim Boyce, supt., office at Consort.

- **Saskatchewan Power Corp.**

Project: 300 miles of 1 to 20-in. distribution lines at Regina, Sask.

Status: Planned.

Contractor: **S. E. Construction (Alberta) Ltd.**, and **Pacific Pipeline Construction (Alberta), Ltd.**, jointly have 166 miles.

Completion: September 1, 1957.

- **Trans-Canada Pipe Lines, Ltd.**

Project: 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg, 310 miles of 20-in. from Toronto to Montreal, 33 miles of 24-in. from Toronto to Niagara, N. Y. (First part of 2,250-mile line from Alberta to Toronto and Montreal. One 675-mile section is being built by Northern Ontario Pipeline Crown Corp.)

Status: Under way.

Contractor: **Majestic Contractors, Ltd.** (104 miles from Burstall to Stewart Valley, Sask., R. L. Leonard, supt., office at Cabri); **Canadian Bechtel, Ltd.** (110 miles from Swift Current to Moose Jaw, Sask., completed, and 87 miles from Portage la Prairie to Winnipeg, Man., to complete August 20, 1957, J. L. (Joe) Work, supt., offices at Portage la Prairie and Winnipeg); **Universal Pipe Line, Ltd.**, subsidiary of Mannix, Ltd. (90 miles from Moose Jaw to Welseley, Sask., supt., Otis Hare, office at Regina, Sask.); **Dutton-Williams Brothers, Ltd.** (97 miles from Deveren to Moosomin, Sask., to complete August 1957, plus 120 miles of 20-in. between Toronto and Montreal); **Price-Poole of Canada, Ltd.** (100 miles from near McGregor to Miniota, Man.); **Oklahoma Pipe Line Constructors** (83 miles of 20, 24-in. between Toronto and Montreal, and between Toronto and Niagara, N. Y.); **Grayco Constructors, Inc.** (120 miles of 20-in. between Toronto and Montreal).

Completion: September 1957.

Project: 82 miles of 30-in. from near Winnipeg to the Ontario-Manitoba border.

Status: Under way.

Contractor: **Majestic Contractors, Ltd.**, K. B. Killingsworth, spread superintendent, office at Ste. Anne, Man.

Completion: October 15, 1957.

- **Union Gas Co. of Canada, Ltd.**

Project: 142 miles of 26-in. from Dawn Township to Hamilton, Ontario, plus 55 miles of 6 to 20-in. laterals, and 317 miles of 2 to 12-in. distribution lines.

Status: Planned.

Contractor: **Canadian Bechtel, Ltd.** has the 26-in. line, to complete November 15, 1957, office at Galt, Ont.

Completion: November 30, 1957.

Pipeline Patrol

• **Westcoast Transmission Co., Ltd.**
Project: 650 miles of 30-in. from Peace River area, Alta., to Sumas, Wash., plus gathering lines.
Status: Under way.
Contractor: **Dutton-Williams Brothers, Ltd.** (120 miles from Taylor B. C. to Azouzetta Lake, completed); **Universal Pipe Lines, Ltd.**, subsidiary of Mannix, Ltd. (110 miles between Huntingdon and Kingsvalle, B. C., F. L. Byers, supt., office at Hope, B. C.); **Canadian Bechtel, Ltd.** (210 miles from Alexandria to Pine Pass, B. C., H. F. (Hank) Mogg, general supt., office at Prince George, B. C.); **R. A. Conyes Construction Co.** (210 miles); **River Construction Corp., Ltd.** (142 miles of 12, 18, 20, 26-in. gathering lines in northern Alta and B. C., E. L. (Tex) Maggard, supt., office at Dawson Creek, B. C.); **Marine Pipeline & Dredging, Ltd.** (Fraser and Peace River crossings.)
Completion: Dutton-Williams and Marine Pipeline work completed. R. A. Conyes to finish work September 1957. Universal Pipe Lines and River Construction Corp. to complete work September 1, 1957. Bechtel to finish August 20, 1957.
Project: 174 miles of 30-in. from Savanna Creek area, Alta., to Canadian-Idaho border.
Status: Proposed.

Foreign Crude-Oil Pipelines

• **Bolivian Gulf Oil Corp.**
Project: 160 miles of 10-in. and 43 miles of 8-in. from Sicascia to Arica on the Chilean coast.
Status: To start late 1957.
Contractor: **Williams Brothers Co.**
Completion: 1958.

• **Burmah Oil Co., Ltd.**
Project: 850 miles of 20-in. from Nahorkatiya to Calcutta, India.
Status: Proposed.

• **Caltex**
Project: 30 miles of 30-in. from Duri field in Sumatra to Dumai where a deepwater terminal will be built. Line will be extended 35 miles to Minas field later.
Status: Planned.
Completion: Duri-Dumai line to be finished in 1959; extension to Minas later.

• **Colombian Petroleum Co.**
Project: 42 miles of 6-in. from Tibu field to Rio de Oro in Colombia.
Status: Under way.

• **C.R.E.P.S., Societe Nationale de Recherche et d'Exploitation des Petroles en Algerie (SN Repal), and Cie. Francaise des Petroles Algerie**
Project: Two 10-in. lines from Hassi Messaoud and Edjele, Algeria to the railhead at Touggourt.
Status: Planned.
Completion: 1958.
Project: 450 miles of 16-in. from Edjele field in southeastern Algeria to a Mediterranean port on the Libyan coast.
Status: Pipe has been ordered.

• **Creole Petroleum Corp.**
Project: 87 miles of 30-in. from Temblador field to Caripito in Venezuela.
Status: To start work early 1958.
Contractor: **Pipe Line Engineering Co.** and **Oklahoma Pipe Line Constructors.**
Completion: April 1958.
Project: 9 miles of 26-in. from Ule to La Salina in Venezuela.
Status: Planned.
Completion: Late 1957.

• **Deutsche-Shell A.G.**
Project: 120 miles of 20, 24-in. from Marseilles, France, to Rotterdam, Germany, to tap the 700 mile trans-Europe line proposed by the Royal Dutch-Shell Group.
Status: Planned.
Completion: 1960.

• **Iraq Petroleum Co.**
Project: About 600 miles of up to 40-in. from Kirkuk field through Iraq to Turkish port of Iskenderun on the Mediterranean.
Status: Proposed. Survey completed.

• **Mene Grande Oil Co.**
Project: 97 miles of 30-in. from fields in Eastern Venezuela to Puerto La Cruz.
Status: Under way.
Contractor: **Fulghum Contracting Corp.** has 22 miles between Oficina and Anaco.
Completion: First quarter 1958.

• **Middle East Pipeline**
Project: 1,500 miles of 38 and 40-in. line from Persian Gulf to Mediterranean at Iskenderun, Turkey.
Status: Proposed.

• **National Iranian Oil Co.**
Project: A 1,000-mile line to move Qum crude to the Mediterranean.
Status: Under study.

• **North-West Oil Pipelines Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N.J.), and British Petroleum Co., Ltd.)
Project: 210-mile line from the refining centers in the industrial Ruhr area of West Germany to Wilhelmshaven.
Status: Planned.
Completion: 1959.

• **Royal Dutch-Shell**
Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, and Netherlands, and Belgium. Main trunk to be 30-in.
Status: Company is considering project together with several other companies.

• **Standard-Vacuum Petroleum Maatschappij.**
Project: 94 miles of 8-in. from Lirik field, Central Sumatra, to deep-water terminal on Siak River, near Buatan. A 3-in. hot-water "defroster" line will be laid under the 8-in. to heat the heavy crude.
Status: Under way.
Completion: Late 1957.

• **Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie**
Project: Line in Sahara Desert area to move oil from Hassi Massaoud field. Two routes possible: 200 miles from the field northwest to Laghouat; 260 miles from the field to the north and slightly east to Biskra.
Status: Under study.

• **Union of Soviet Socialist Republic**
Project: 2,300-mile Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Balkal.

• **Yacimientos Petroliferos Fiscales** (Argentina)
Project: 932 miles of 12-in. from Campo Duran to San Lorenzo.
Status: Under way.
Contractor: **TECHINT** (Compania Tecnica Internacional), Buenos Aires, has 90 miles.

Foreign Products Pipelines

• **Empresa Nacional de Petroleos** (Government of Chile) and **Cia. de Petroleos de Chile (Copec), et al.**
Project: 75 miles of 10-in. from Chile's coastal refinery at Concon to Santiago.
Status: To start work September 1957.
Contractor: **Williams Brothers**
Completion: Early 1958.

• **Israeli Government**
Project: A 6-in. line from the Haifa refinery to Tel Aviv.
Completion: Late 1957.

• **North Atlantic Treaty Organization**
Project: 2,000 miles of lines to airfields in parts of Europe.
Status: Under way.
Contractor: **Associated Pipeline Contractors, Inc.** (450 miles from Iskenderun, Turkey to Batman); **TECHINT** (205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir).

• **Yacimientos Petroliferos Fiscales** (Argentina).
Project: 497 miles from Mendoza to Buenos Aires.
Status: Proposed.

Foreign Natural-Gas Pipelines

• **Andes Pipeline Corp.** (Glenn McCarthy, Inc).
Project: 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper-mining area.
Status: Proposed.
Contractor: Will do own work.

• **Attock Oil Co.**
Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.
Status: Planned.

• **Cia. Shell de Venezuela.**
Project: 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula.
Status: Under way.
Contractor: **Williams Brothers Co.**
Completion: 1957.

• **Gaz de France**
Project: 550 miles of 16 to 24-in. from Lacq field, southwestern France, to Paris, plus a 10-in. lateral to Nantes and 12 to 16-in. laterals to Lyons, making a 1,000-mile system.
Status: Right-of-way work under way.
Contractor: French contractors.
Completion: First stage in 1958; complete system in 1960.

• **Petroleos Mexicanos**
Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey.

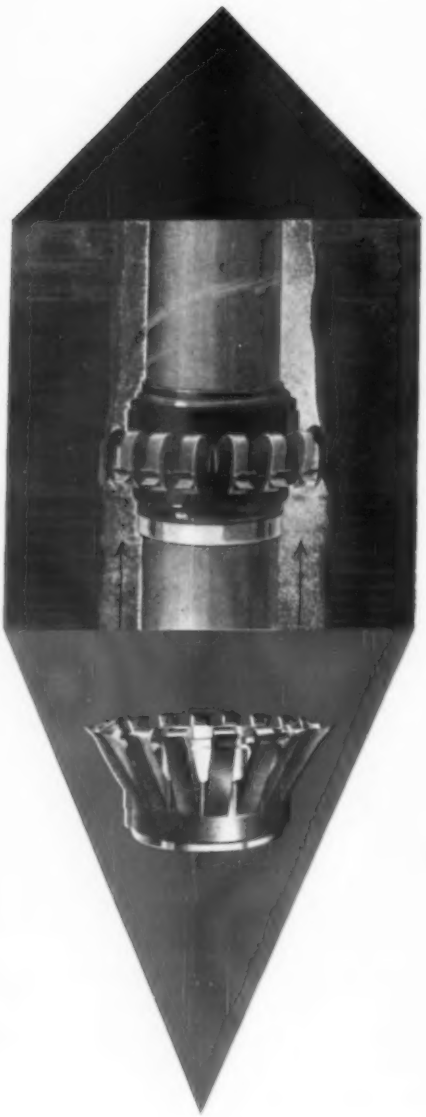
• **Sui Gas Transmission Co.**
Project: 217 miles of 16-in. from Sui gas field to Moultan, Pakistan.
Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang, Magiana, and Montgomery.
Contractors: **Pakistan Constructors,** a joint company of **Morrison-Knudsen** of Boise, Idaho, and **William Press, Ltd.,** of London.
Project: 145-mile line from Sylhet to Dacca, East Pakistan.
Status: Under consideration. If approved construction could start December 1958.

• **Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venezuela.**
Project: 207 miles of 26-in. from Anaco fields to Caracas.
Status: Under way.
Contractor: **Fulghum Contracting Corp.** will be consultants; **Petrogas, S. A.** will engineer and construct the line.
Completion: Spring 1959.

• **Union of Soviet Socialist Republic.**
Project: 808 miles of 26-in. from Stavropol in the Northern Caucasus to Moscow, to serve Voroshilovgrad, Voronezh, Tula, Yeleta, and Serpukhov.

• **Yacimientos Petroliferos Fiscales (Argentina)**
Project: 1,056 miles from Campo Duran to Buenos Aires.
Status: Planned.

design for better performance



HALLIBURTON'S NEW **RECIPO WALL CLEANERS**

Provide...

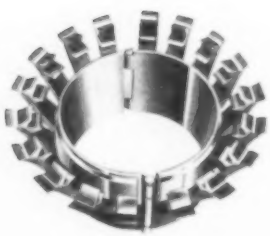
- ★ Better Bonding of Cement
- ★ More Efficient Removal of Filter Cake
- ★ Less Cement Channeling

The Halliburton Recipo Wall Cleaner aids in effecting better bonding of cement to the formation and casing by removal of filter cake as casing is reciprocated.

The Recipo Wall Cleaner, with wide, tough claw-like rubber fingers molded to a steel collar, is hinged for easy installation on the casing. The design of the cleaner permits freer passage of cuttings, lost circulation materials and viscous fluids. The rubber fingers minimize possible bore hole or filter cake damage while running casing, yet are sufficiently rugged to clean the wall thoroughly and effectively at desired points when casing is reciprocated.

ADVANTAGES OF THE RECIPO WALL CLEANER INCLUDE:

- Wide fluid passage areas between fingers reduce circulating pressures and bridging action of filter cake cuttings, with or without lost circulation materials.
- Wide cleaning fingers clean more bore hole area . . . aid in breaking up channeling action of cement through drilling fluid.
- Increased velocity of fluid circulation between rubber fingers scours the walls of the hole for better cleaning.



A four-page bulletin describes and illustrates the Recipo Wall Cleaner in greater detail. For your free copy, contact your nearby Halliburton field representative.

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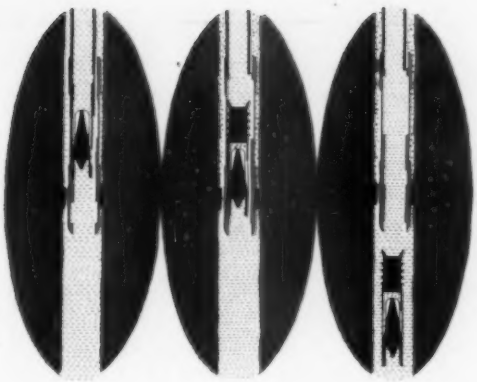

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HALLIBURTON'S

New

FULL-FLOW PACKER SHOE

DESIGNED TO ELIMINATE COSTLY DRILL-OUT AFTER CEMENTING

The new Halliburton Full-Flow Packer Shoe is designed to meet the need for a packer-type cementing shoe to protect the formation below while cementing tubing or casing in new or old uncased wells.

No internal parts in the tool remain to be drilled out after completion of the cementing operation:

★ Upon completion of cementing, drilling rig may be moved off; seats and plugs are discharged out of the bottom of the shoe into the open hole.

★ Since no drill-out is required, possible drilling fluid damage to formation below shoe is reduced.

★ The elimination of expensive drill-out time makes the tool particularly suitable for small tubing strings.

There are numerous other applications of the new Halliburton Full-Flow Packer Shoe:

★ For protection of weak formation while cementing tubing or casing in oil, gas or water injection wells.

★ Fracture or treatment of old wells where no casing is in the hole ... Tubing or casing is cemented before well is fractured to improve production.

★ Plugging back or killing wells having excessive bottom hole pressure.

★ Suitable for wells where other Packer Shoes should not be used because formation water pressure below packer is greater than hydrostatic head of cement around the outside of the casing.

Be sure to get your free copy of the new bulletin describing the Full-Flow Packer Shoe. Call your nearby Halliburton representative or write to the Halliburton Oil Well Cementing Company, Duncan, Okla.

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Among the

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New Drilling Firm's Initial Barge Rig Going to Work On Louisiana Coast Bearing Name of Veteran Oil Man

When Producers' Drilling Co. named its initial drilling barge, recently launched at Orange, Tex., it gave recognition to the long drilling experience of W. F. Youngblood, the company's vice president and general manager.

The barge, bearing the name of "W. F. Youngblood" will be ready to start drilling in shallow-water areas of coastal Louisiana. Its first location will be near the mouth of the Mississippi River, in Plaquemines Parish, where it will drill in 14 ft. of water for Continental Oil Co.

Producers Dilling Co. is a recently formed company to engage in contract-drilling operations. Organizers and top personnel include, in addition to Youngblood, J. L. Goldman, president; and Leonard Glade, secretary-treasurer. Youngblood, a drilling veteran, came to the new company from Penrod Drilling Co., of Shreveport, with which he was assistant drilling superintendent. Goldman is a pioneer in design and construction of offshore floating drilling equipment.

The barge was constructed at Levingston Shipbuilding Co.'s Orange, Tex., yards with Friede & Goldman, Inc., naval architect firm, as engineering consultant. It is of submersible, slotted-type design, capable, with its contained facilities, of drilling to depths in excess of 20,000 ft. It can drill in water depths up to 17 ft.

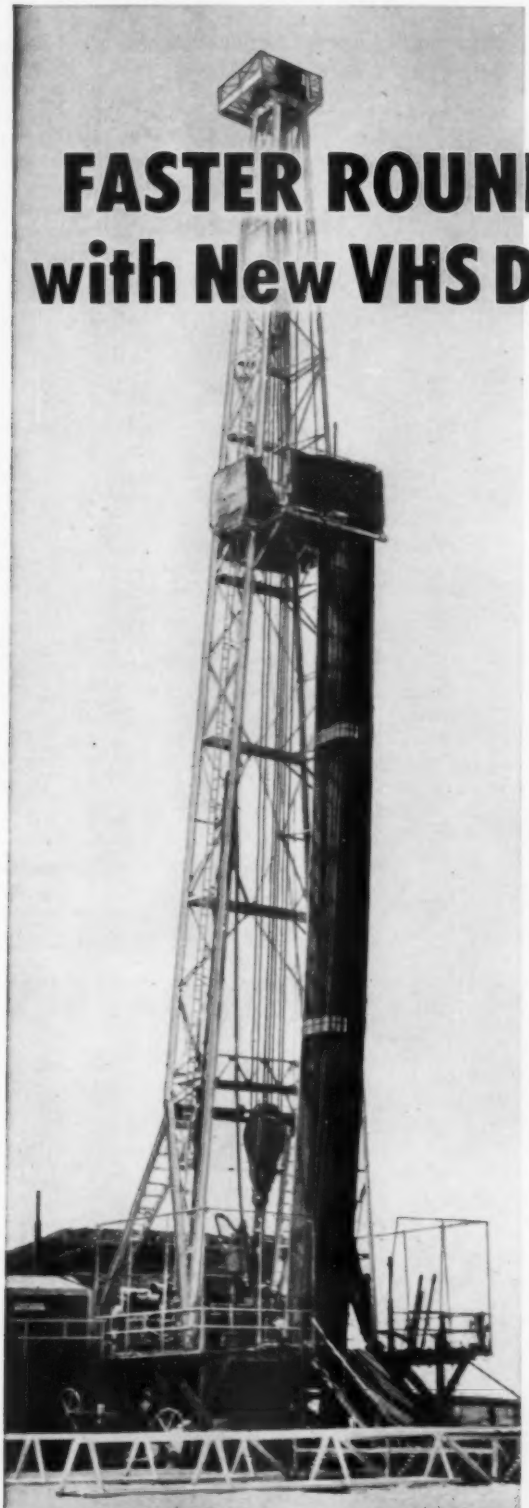
The drilling platform is located amidships, elevated above the barge's upper deck. It mounts a Unit Rig U1220 draw works, a 27½-in. rotary table, and a Lee C. Moore 142-ft. 1,025,000-lb. capacity cantilever-type mast. Four Caterpillar turbocharged D397 diesel engines, mechanically compounded, drive the draw works, rotary table, and two Continental-Emsco Model D-1000, 8¼-in. by 18-in. mud pumps, installed on the lower deck. Two additional turbocharged diesel engines (Type D375) drive the generators supplying the barge's electrical power.

Pipe-storage area is on the upper deck astern of the drilling platform. It carries the barge's initial stock of 15,000 ft. of 5-in. O.D., Grade E drill pipe.

Accommodations for crew members are built integrally into the forward portion of the barge's upper deck. They house 28 men. All living quarters are air-conditioned, and contain adequate galley and storage facilities to provide for sustained operations in remote swamp locations and offshore areas.

The two tool pushers assigned to the barge are Charles O'Brien and Bates Callico.

Drilling veteran, W. F. Youngblood, rests in front of draw works on Producers' Drilling Co.'s initial drilling barge, which bears his name. The recently launched barge soon will be ready to start drilling in Coastal Louisiana's shallow-water areas.



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• Faster round trips are just one of the advantages you get with rotary drilling lines of new LAY-SET VHS. Made of a new grade of steel for wire rope, new VHS is at least 15% stronger than Improved Plow Steel—the strongest available before VHS.

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This extra strength allows you to drill deeper before increasing the number of parts of line. You can make faster round trips. And the extra strength of new LAY-SET VHS eliminates, in many cases, the necessity for buying new blocks or regrooving sheaves to use larger diameter lines for higher safety factors.

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10 lines of new LAY-SET VHS have a safety factor of 14.9 or 15% higher than 10 lines of IPS. In fact, the safety factor for 10 lines of VHS is equal to that for 12 lines of IPS.

RESISTS ABRASION, PEENING

New VHS is also tougher. It has greater resistance to abrasion and higher resistance to peening—both important factors in maintaining shape and diameter. If regular adaptable cut-off practices are followed, ton-mile advantages should result.

WINCH LINES, TOO

Now winch lines of stronger, tougher VHS are also available. Call your Hazard distributor for rotary drilling lines or winch lines of new LAY-SET VHS. You don't need any complicated specifications—just tell him the size and diameter you want.

for further information write to the nearest Hazard office for Brochure **DH-522**

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Circle Drilling Co., Lake Charles, La., has contracted for another deep test to be drilled in the Grand Coulee area, in northern Acadia Parish, South Louisiana. It is a wildcat for Dixon Management Corp., of Houston, at 1 Smith-Miller, in 1-8s-1w. Location is northwest of Grand Coulee field. Contract is for 10,300 ft.

Woolf & Magee, Tyler, Tex., have two new contract jobs for Nebo Oil Co., Inc., of Dallas. One is an 11,000-ft. Smackover test for the Carterville area, about 1¾ miles west of Springhill, in northern Webster Parish, Northwest Louisiana. The other is a 4,500-ft. Wilcox test 1¼ miles northwest of Rogers field, 10 miles southwest of Jena, in LaSalle Parish. The Carterville deep test, 89 Nebo fee, in 16-23n-11w, is an attempt to confirm Smackover gas-condensate production discovered by Carter Oil Co. in that area a year ago. The LaSalle Parish job is at 94 Nebo fee, in 31-7n-3e.

B-M Drilling Co., Inc., Boosier City, La., is contractor on another test Gulf Oil Corp. is starting in the Honore area, 2 miles north of Bossier City, in Bossier Parish, North Louisiana. It is a 5,800-ft. Travis Peak test at a 40-acre location southwest of the field's discovery well completed by Gulf last May with production from a 5,650-ft. Pettet sand. Since completion of the discovery well, Gulf has drilled a dry hole at the northeast location.

Travis Ward Drilling Co., Cayuga, Tex., is getting well along on a newly started contract operation in northwestern Freestone County, East Texas. It is an 8,000-ft. Travis Peak test for Four W Oil Co., of Corsicana, Tex., on the latter's Sneed lease, in the Wiley Carter Survey, 3 miles southeast of Streetman. Nearest production is in the Kirvin area, 4½ miles southwest. Production there is from the Rodessa and Pettet horizons.

Barnwell Drilling Co., Shreveport, has a new wildcat operation in northern Harrison County, northeastern Texas. It is a 7,000-ft. Pettet test for Barnwell Production Co. Location at 1 Deakins, in the L. H. Mabbitt Survey, is 3 miles north of Hallsville. It is 3 miles east of North Lansing field, nearest production (Rodessa and Travis Peak), and about 5 miles southwest of nearest Pettet production, in Northeast Hallsville field.

Justiss - Mears Drilling Co., Jena, La., is on a new wildcat location 4 miles west of Jonesville, in Catahoula Parish, eastern Louisiana, for a 5,500-ft. Wilcox test. It is a contract job for W. E. Butler, of Dallas, at 1 Zenoria. Location is about 2½ miles southwest of a 5,200-ft. Wilcox test being started by Durbin Bond, Inc., of Little Rock, with **Crow Drilling & Producing Co.,** of Shreveport, as the contractor. The latter test, 1 Alexander Unit, in 21-8n-6e, is a little more than 3 miles northwest of Jonesville, La. Spot location of the Justiss-Mears job is in 32-8n-6e.

J. W. Mecom, Houston, has one of his rigs on a well-deepening job for Richardson & Bass in the Three Bayou Bay area, 25 miles south of New Orleans, in Jefferson Parish, Coastal Louisiana. The well, on the west flank of the field, was abandoned last year at total depth of 12,553 ft. It was drilled as 1 Humble-L. L. & E., spotted in 7-18s-24e. Richardson & Bass are deepening and reworking it as 4 L. L. & E.-State Lease 2707 ft.

South States Drilling Co., Longview, Tex., is to drill a 7,600-ft. Woodbine test at a wildcat location 7 miles northeast of Quitman, in eastern Wood County, East Texas. It is a contract job for F. R. Jackson and B. A. Holman, also of Longview, at 1 Keys, in the James Duncan Survey.

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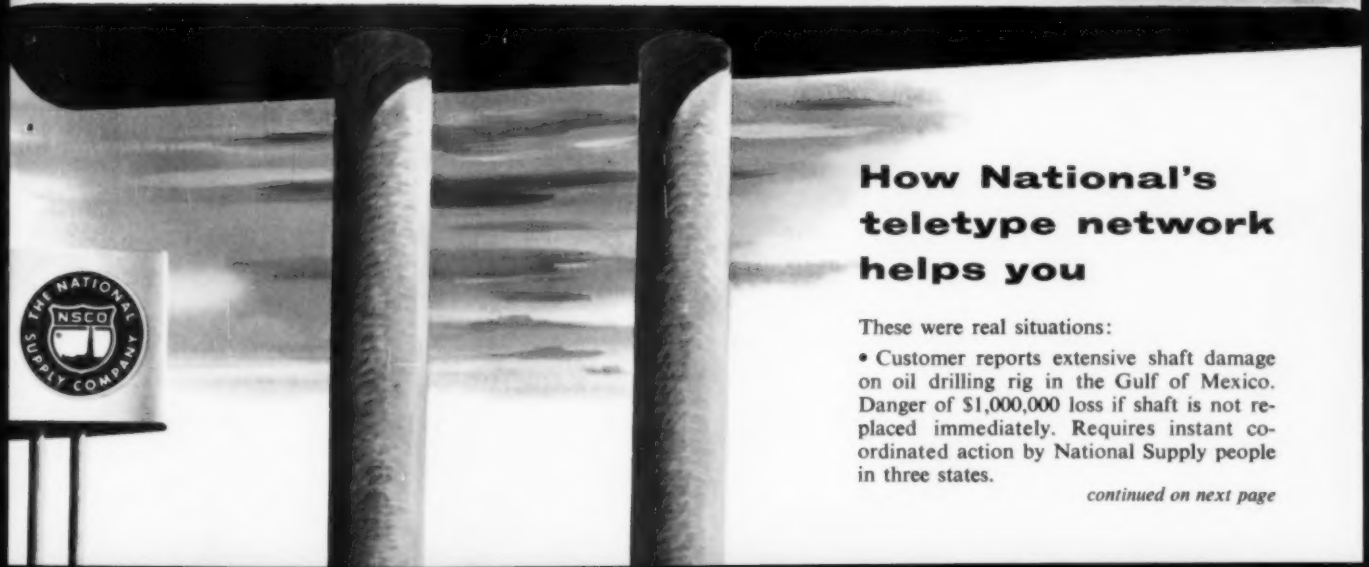

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These were real situations:

• Customer reports extensive shaft damage on oil drilling rig in the Gulf of Mexico. Danger of $1,000,000 loss if shaft is not replaced immediately. Requires instant coordinated action by National Supply people in three states.

continued on next page

• Customer requires second hand oil drilling rig. Good chance for sale if one of our offices can locate the right model rig somewhere in the U. S. immediately.

• Fire at oil drilling site. Big machinery damaged. Spare parts must be obtained from warehouses in Texas and Louisiana and plant in California. Must have estimate of damage, repair costs and delivery date today.

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It takes good communications to do business with the oil fields, where emergencies are big and demand fast action. They must be especially good when six plants, 129 stores, 68 branch offices and 700 field men are involved. Good communications have been essential in making National Supply the world's largest manufacturer and distributor of oil field machinery and supplies. Good communication—plus the most complete line of quality equipment available. Next time you're facing an emergency, one phone call to National can put all these benefits to work for you.

At Pittsburgh, heart of our 103-station teletype network, this punched tape speeds information to the oil fields.

Get trouble-free production with safe, flexible National hook-ups

You can check a National Wellhead assembly from the bonnet to the casing flange, and find all the features you need for safe, sure operation. Look at these outstanding features of National Wellhead Equipment—

Ease of assembly—parts are self-locating and self-activating, no special tools are needed for installation.

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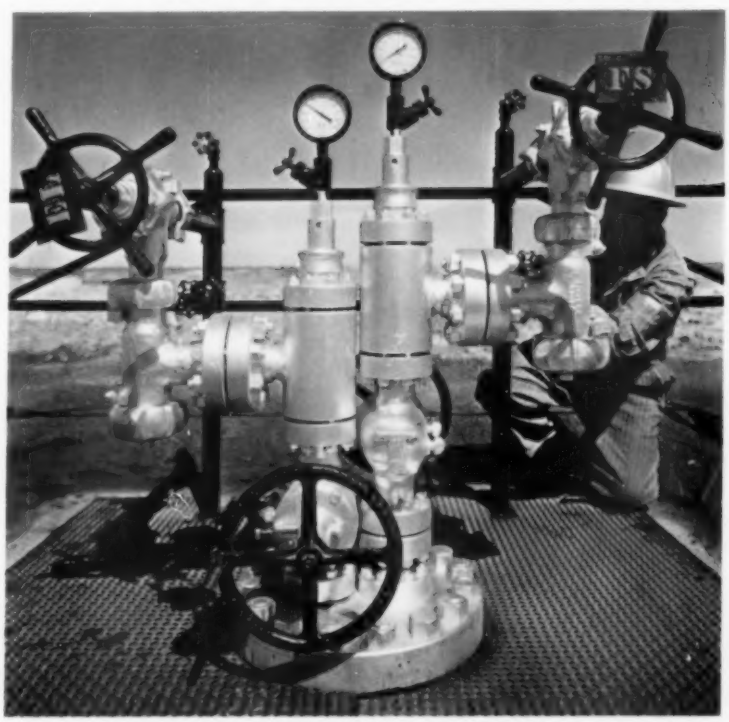

Dual-completion wellhead assemblies like this National installation are very economical under the proper conditions. This operates two strings of tubing, and has two master valves to allow maintenance on one without stopping production on the other.

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DIVISION OFFICES: Denver; Fort Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E. C. 1

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

More quality production equipment on the next page...

Get low cost reliable

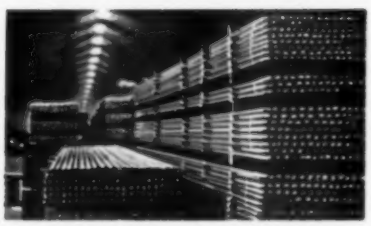
pumping with National units

Having trouble with load reversals? National Pumping Units have an extra margin of strength that meets this problem. They have exceptionally hard alloy steel gears and pinions designed for long wearing life. Gear train mounting and main bearings offer lower shaft loading and deflection . . . easily handle shock loads from load reversals.

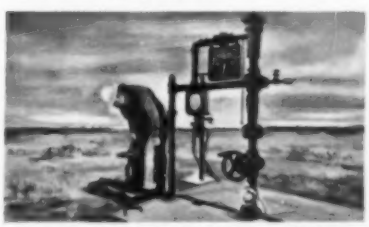
There are other important National Pumping Unit features that insure dependable operation:

- Easy-to-install, strong main base.
- Exceptionally stable, well balanced samson post.
- Pitman assembly features easy maintenance, fast assembly.
- Rugged walking beam and beam hanger for extra years of service.

Get the facts on National Pumpers today. For the full story on the high performance and low operating costs they offer, see the National Supply Store men or representatives in your area soon. New bulletins giving the complete story on these quality pumping units are available.



Get reliable service, too, from precision-made National Sucker Rods. They have top resistance to fatigue, shock, corrosion and impulse loads. Available in a range of grades for every condition.



For certain types of wells, the National Plunger Lift can be the best production method. It uses either formation gas or injected gas for operation. See your National representative for details.

Remember National Triplex Pumps for waterflooding and a host of other oil field pumping jobs. They're available in several h.p. ratings for both corrosion and non-corrosive service.

THE **NATIONAL SUPPLY** COMPANY

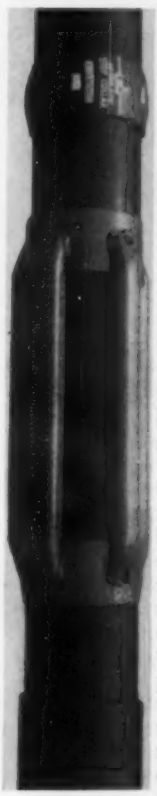
MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Pa.
DIVISION OFFICES: Denver; Fort Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E. C. 1

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

SHOWCASE...

NEW EQUIPMENT

Solid Casing Stabilizer Speeds Cement Jobs



This new B & W solid type of stabilizer can be mounted between welded lugs or, without welding, between an automatic stop collar and the casing couplings, the maker reports. The stabilizer ribs are formed to furnish smooth running and high strength to hold the casing away from the formation. They also are designed to aid in the proper conditioning of the hole for cement placement.

Each stabilizer rib is formed with circulation ports. As the casing, equipped with the stabilizers, is lowered into the well, circulation of mud behind the stabilizer ribs and through the circulation ports is established automatically and continues through the running of the casing and during the cementing operation. **Write or call: B & W, Inc., P. O. Box 5266, Houston 12, Tex., for details on solid type of stabilizers.**

●

PVC Lift Check Valve Removes for Servicing

This new polyvinyl chloride lift-check valve designed for petrochemical-plant and petroleum-industry service will operate in either a vertical or horizontal position, and open and close under less than a pressure of 6 psi., according to the manufacturer. A full flow area is provided.

The valve's only moving part is a self-energizing disk. Available in sizes from ½ through 3 in., the valve comes in threaded or socket-welding types. Its material is normal impact PVC.

The valve is designed to be easily and quickly removed from the line for cleaning and servicing, when required. **Write or call: Tube Turns Plastics, Inc., 2929 Magazine Street, Louisville 11, Ky., for details on PVC lift check valve.**

●

Gas-Density Balance Helps Control of Process Streams

Applications for this new 3A gas-density balance, the maker reports, include: (1) continuous density measurements of hydrocarbon process streams; (2) continuous hydrogen readings on H_2 blanketed generators; and (3) other applications where specific gravity or density provides an index to gas-stream properties.

The balance measures the density of a sample gas by a null-balance principle. A small dumbbell is supported on a horizontal quartz fiber. One ball of the dumbbell is punctured so it won't experience buoyancy effects. The other ball rises or dips as gas density changes.

The dumbbell, metal coated to make it conductive, is held in place by an

electrostatic force established with adjacent electrodes held at a fixed potential. When the dumbbell rotates, it is restored to its null position by applying the proper electrostatic potential to its surface. The magnitude of the balancing potential is proportional to sample density. The balancing potential is used to operate a meter mounted on the door of the balance or on an external indicator or recorder.

The instrument is built into a vapor-tight steel case. The range selector switch and operating controls are mounted on the door. **Write or call: Arnold O. Beckman, Inc., 1020 Mission Street, South Pasadena, Calif., for Bulletin 118A.**

Send this **Showcase Coupon**

to the Manufacturer of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of August 5, 1957

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

SHOWCASE . . .

New Equipment

Pocket pH Meter Aids Acidity, Alkalinity Control

Accurate control of pH—acidity and alkalinity—may be achieved with this new pocket pH meter, according to the maker. It can be used to measure the pH of drilling muds to determine consistency and to help prevent the corrosion of pipelines and other equipment. The instrument can be used, too, in spot checking automatic systems that control wash, waste, cooling tower, blowdown, and boiler waters.

Lightweight and portable, the meter provides convenient pH readings in the laboratory or plant. It may be readily taken into the field for immediate on-the-spot measurements.

The combination glass and reference electrode allows the operator a free hand to make notations. A range of 2 to 12 pH is possible with readability to 0.1 pH.

The instrument, powered by six flashlight batteries, weighs 2 lb. and measures 6 in. long, 3 in. wide, and

2 in. deep. Its case is made of acid-resistant melamine plastic. The dial face is scratch-resistant polystyrene. Simple instructions on the back of the case explain how to operate the meter. **Write or call: Scientific Instruments Div., Beckman Instruments, Inc., Fullerton, Calif., for details on pocket pH meter.**

●

Dew-Point Monitoring Detects Moisture Rise

Moisture buildup in air lines of pneumatically operated instruments is detected by this new dew-point monitoring system, the maker reports. The system detects unfavorable moisture buildup when it approaches the danger limit. It then actuates an alarm.

The system comprises two devices: a precise humidity controller containing a sensitive electronic switch that actuates an alarm when a preset dew-point temperature is exceeded and a small plug-in type of electric hygrometer sensing element which senses moisture content instantly and relays these changes to the humidity controller.

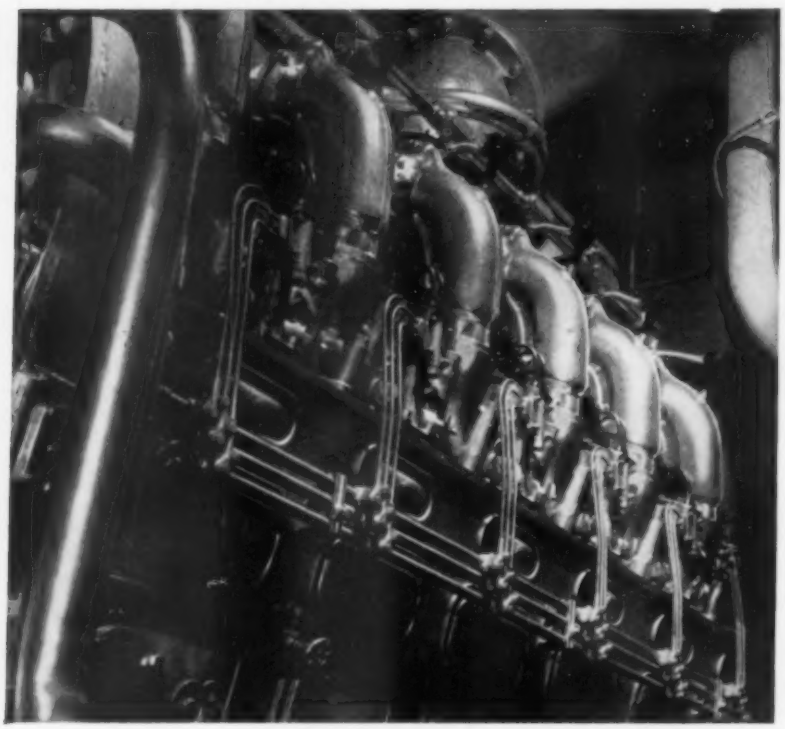
The sensing element is directly installed within the pressure system by a threaded mounting, eliminating the need for sampling to monitor dew-point temperatures.

The humidity controller may be set to actuate an alarm for dew-point temperatures as low as —45° F. at 50 psi. and —60° F. at 150 psi. This equipment may be safely used in pressure systems up to 1,000 psi., according to the maker. **Write or call: American Instrument Co., 8030 Georgia Avenue, Silver Spring, Md., for Bulletin 2273.**

●

Air Compressor Offers Power for Remote Areas

Here's an automatic skid-mounted diesel air compressor unit, called Dies-l-air, designed for service in remote areas where commercial power is



WHEN CORROSION SETS IN...

the bigger they come, the harder they fall

MUTUAL

Sodium Bichromate
Sodium Chromate
Chromic Acid
Potassium Bichromate
Potassium Chromate

How much is corrosion costing *you?* One-third of U. S. steel manufacture goes to replace equipment loss from corrosion. Add to this the loss of manhours, product, production.

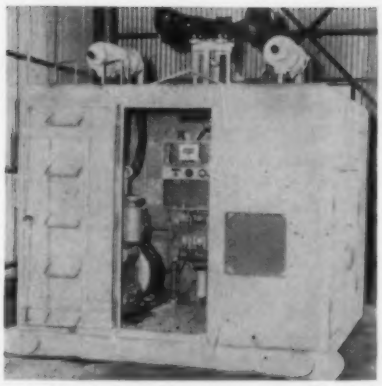
Mutual chromates offer inexpensive dual protection against corrosion: they make waters non-corrosive while making metal surfaces corrosion-resistant. These inhibitors may be introduced either as sodium chromate or bichromate.

Protecting the cooling system of the big marine diesel shown above presents a tough problem which is licked effectively and inexpensively by Mutual chromates. For detailed information on this and other applications, ask for the Mutual brochure "Corrosion Inhibition with Chromate." You'll find it profitable reading. Address Dept. C1-10-1.

Mutual Chromium Chemicals

Allied Chemical

SOLVAY PROCESS DIVISION • 61 BROADWAY, NEW YORK 6, N. Y.



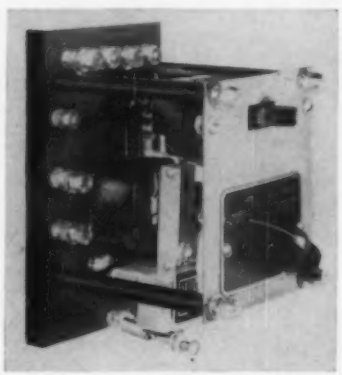
not available such as on offshore drilling rigs and production platforms. The compressor unit has a capacity range of 30 cu. ft. per minute at 60 psi. and 26 cu. ft. per minute at 100 psi.

The unit includes a two-cylinder Nordberg diesel engine which has one cylinder converted to an air-compressing cylinder. The diesel cylinder head is replaced by a compressor cylinder head. But the piston and rings are unchanged.

A concentric type of compression valve, which combines both suction and discharge in a single unit, is incorporated in the head.

The unit operates at 800 r.p.m. Its radiator has sufficient capacity for effective operation at ambient temperatures of 125° F., the maker reports. A thermostat maintains the jacket water temperature at 180° F., even at light loads. **Write or call: Automatic Power, Inc., 205 Hutcheson Street, Houston, Tex., for details on automatic diesel air compressor.**

●



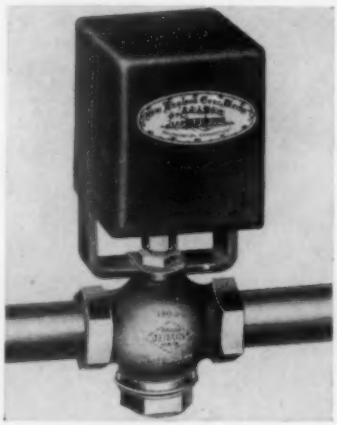
Gas-Engine Remote Control Adapts Plant for Standby

This new gasoline-engine remote-control unit is designed primarily for adapting push-button-started electric plants for use as standby plants.

The ASCO Bulletin 216 control adapts such plants to standby automatic operation under control of the transfer switch. It contains both a cranking-disconnect relay and an over-cranking-disconnect unit. In addition, it has a four-position selector switch (manual, stop, automatic, and test.)

The transfer switch with which it is used must be equipped with one contact which opens and a second contact which closes when the normal power source fails. **Write or call: Automatic Switch Co., Florham Park, N. J., for Bulletin 216.**

●



Globe Valve Permits Automatic Operation

In this New England motorized globe valve, most desirable features of automatic valve operation are incorporated in one unit, the maker announces. It's available in 10 sizes from ¼ to 3 in. Employing a bronze globe body, it comes in three voltages (24, 115, and 230 volts) and in three timing cycles (8, 32, and 139 seconds.)

The unit is said to be easily adaptable to a number of applications in heating and processing. It features automatic disk compensation, tight shutoff, 150 psi. working pressure, positive operation without linkage, and only eight moving parts.

The unit can be controlled by any positive-action single-pole double-throw switch. These include temperature, float, manual, time, program, or pressure actuated switches. **Write or call: New England Gear Works, South End Road, Southington, Conn., for details on motor-operated globe valve.**

●

Vapor-Phase Analyzer Offers Flexible Gas Analysis

A reliable and flexible method of making a wide variety of qualitative and quantitative analyses of gases and low-boiling liquids with extreme precision is offered by this new Cenco vapor-phase analyzer for gas chromatography, according to the maker.

The vapor phase analyzer is housed in a Cenco standard cylindrical oven which can maintain constant temperatures, thermostatically regulated to ±0.5° C., from room temperature to 210° C. Helium, nitrogen, hydrogen, dried air, and a variety of other carrier gases may be used.

The detector is reportedly a Gow-Mac diffusion type of thermal-conductivity cell with a time constant of less than 1 second and negligible drift.

The analyzer comes complete with one 10-ft. coiled column, packed with

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

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Described in OIL AND GAS JOURNAL - Issue of August 5, 1957

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

Stop that tubing job....

...here comes a

VoluMAX!

If you need an increase in volume to meet your allowable, DON'T replace the tubing. Instead, call J&L Supply.

An Axelson VoluMAX pump will get you from 10% to 27% more barrels per day without increasing your cycle rate.

Or, if your production is ample but your cycle rate is too high, reduce the cycle rate by installing an Axelson VoluMAX pump.

Make tubing jobs obsolete where increased volumes are required by replacing conventional pumps with Axelson VoluMAX.

To find out what increase you could reasonably expect from this two-in-one pump, or for literature that will give you technical details, call J&L Supply now.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L – A GREAT NAME IN SUPPLIES

39

New Equipment

tricresyl phosphate. Other packed columns are available. Column pressure is continually variable from 0 to 30 psig. The standard column flow-meter range is variable from 0 to 80 ml. per minute. Other ranges up to 425 ml. per minute are available.

Liquid samples may be introduced into the analyzer in 10, 20, and 40 microliter quantities. Binding posts on the vapor-phase analyzer are provided for direct connection to a recorder with a range of 0 to 10 mv. for general use.

The unit is 18⅝ in. wide, 15 in. deep, and 27½ in. high (less thermometer and flow meter). It weighs 58 lb. Power requirement is 500 watts at 110 volts a.c. **Write or call: Central Scientific Co., 1700 Irving Park Road, Chicago 13, Ill., for details on vapor-phase analyzer.**

●

Proportioning Pump Allows Capacity Change

This new proportioning pump comes in capacities from 0.003 to 796 gal. per hour (simplex) and in working pressures to 16,500 psi. It features stroke-length adjustment of capacity from 0 to maximum while running, in all sizes.

Pump loads are taken up by bearings on both sides of an eccentric. All moving parts operate in an oil bath.

The pump has a guaranteed repeatable volumetric accuracy of ±1 per cent in all sizes, the maker reports. Enclosed gasketing at pressure points prevents leakage. Three types of control are available. **Write or call: Capacitrol Pump Co., 15th Street & Fairmont Avenue, Philadelphia 30, Pa., for details on proportioning pump.**

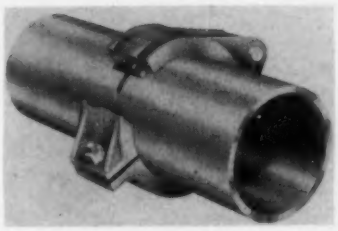
●

Self-Aligning Coupling Speeds Pipe Installation

Fast installation is a feature of this self-aligning pipe coupling. Designated as the SS (smooth seal), it is intended for light-wall stainless-steel flow lines where corrosion is a factor, the maker reports. It is suitable for permanent or temporary connections, emergency repairs, or testing. No preparation is needed for pipe ends.

A tapered gasket design and internal lip are reported to give smooth sealing action and provide an even interior surface. The gasket compresses within itself and moves uniformly around the pipe, affording an allowance for misalignment of pipe ends.

The coupling is designed for a working pressure of 100 psi. and for pipe



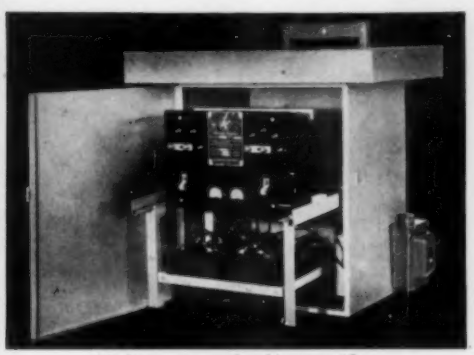
sizes up to 12 in. Gaskets are available in various compositions of synthetic and natural rubber. **Write or call: Swepco Fittings, Inc., 6 Clifton Boulevard, Clifton, N. J., for details on smooth-seal fittings.**

EXTRA *DEPENDABILITY*

FOR ANY CATHODIC PROTECTION PROGRAM

HOLCOMBE SELENIUM RECTIFIERS

Small size steel cabinet rectifier.



Medium size steel cabinet rectifier.

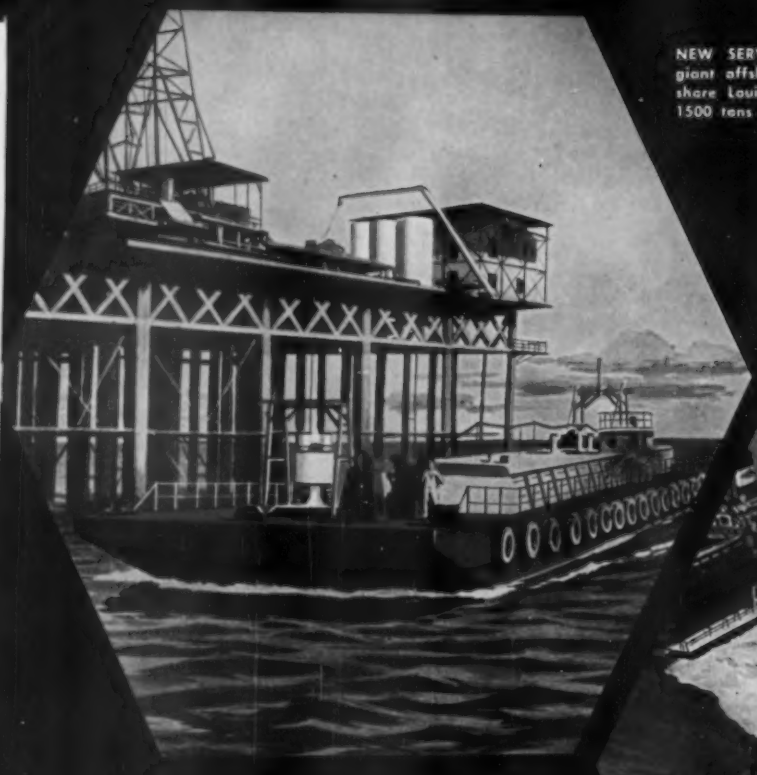
Backed by fourteen years' experience in corrosion prevention, Holcombe rectifiers are soundly designed, ruggedly built, and carry an exceptionally long term warranty. That's why you'll find them all over the country, in use by major oil, pipeline and industrial firms. No matter what your rectifier application may be, there's just the right Holcombe unit to fit the job. Available in all sizes, they are made with cabinets of cadmium plated steel or aluminum. *Write for new literature on Holcombe rectifiers and other corrosion products.*

THE HOLCOMBE COMPANY, INC.

FIRST NATIONAL BANK BUILDING TELEPHONE 5-3468
SHREVEPORT, LOUISIANA
RECTIFIER DIVISION 617 MONTGOMERY ST. TEL. 4-1477

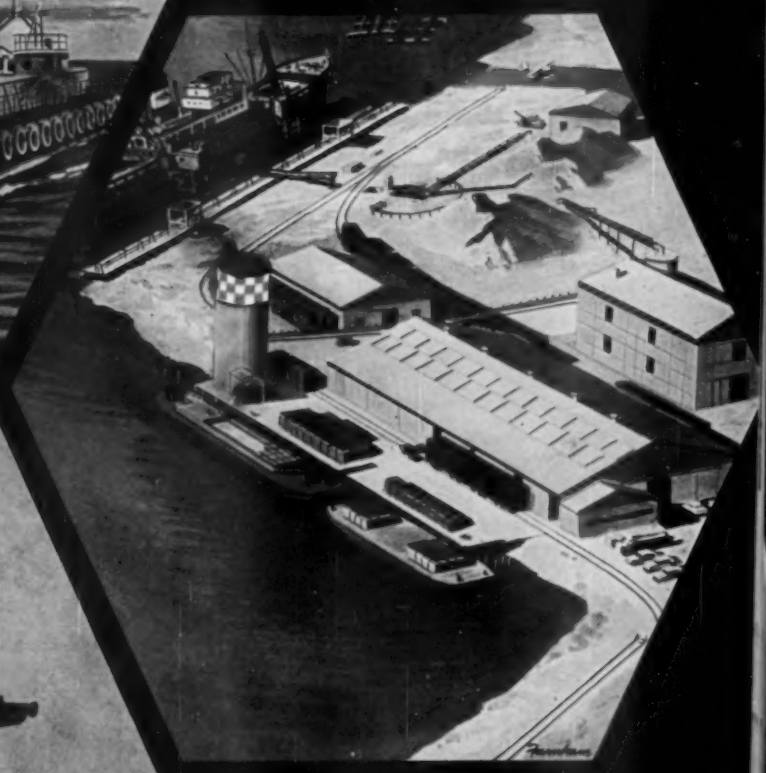
HOLCOMBE COMPANY OF CANADA, INC.
323 BARKER BUILDING TELEPHONE 6-7291
CALGARY, ALBERTA, CANADA

Lion Coatings • Holcombe Selenium Rectifiers
Pipe Wrappings • Graphite Anodes • Coke Breeze

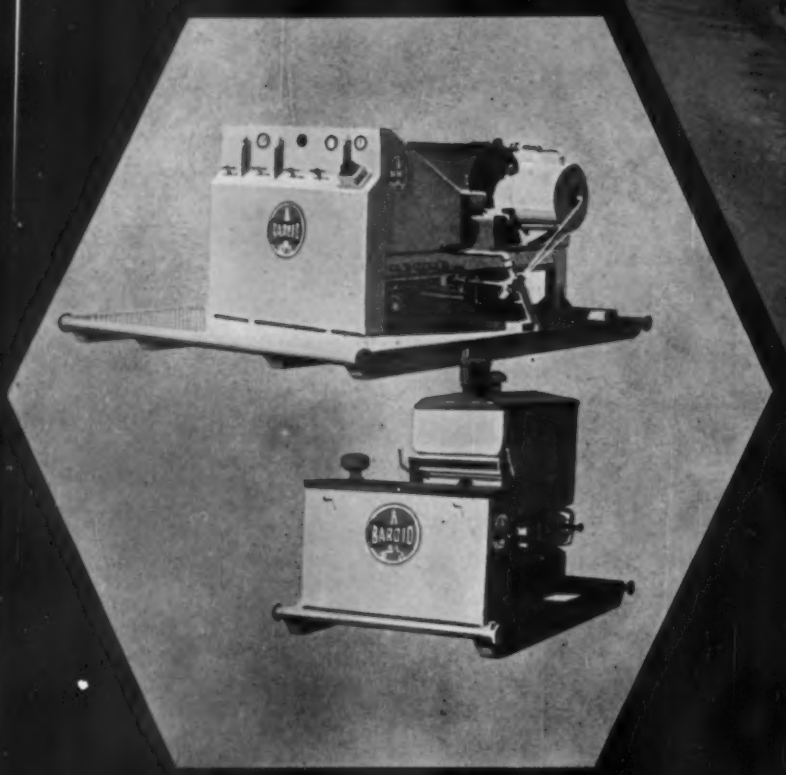


NEW SERVICES . . . such as the "Mr. George," giant offshore delivery vessel now serving offshore Louisiana Gulf Coast rigs. Carries up to 1500 tons of mud materials per load.

BAROID



NEW PLANTS . . . such as the new Marine Terminal and mill at New Orleans. Baroid has increased its stockpiles of products at all important points.



NEW EQUIPMENT . . . such as the BAROID MUD CENTRIFUGE for discarding drilled solids and reclaiming mud weight materials. More than pays for itself in mud savings and ease of mud control.

TO GIVE YOU BETTER SERVICE . . . Baroid has increased its number of service centers, field personnel and distribution facilities. Baroid products and services are now more readily available than ever before, everywhere in the United States, Canada, Venezuela and offshore. There is no question of "can I get what I need" when you specify BAROID.

continues to set the pace for mud service!

NEW PRODUCTS . . . nearly a dozen new, field-proved mud products for fast, economical drilling. New lost circulation materials, surfactants, emulsifiers, thinners, anti-contaminants . . . each a champion in its class.

WHEN YOU BUY BAROID — YOU BUY THE BEST!

BAROID

BAROID DIVISION • NATIONAL LEAD CO.
Main Office: P. O. Box 1675, Houston 1, Texas

This year, as your drilling activity speeds up, you will find Baroid already prepared to meet your increased mud needs. Baroid foresaw your requirements and *now has in service* new plants, new products, new equipment and new services.

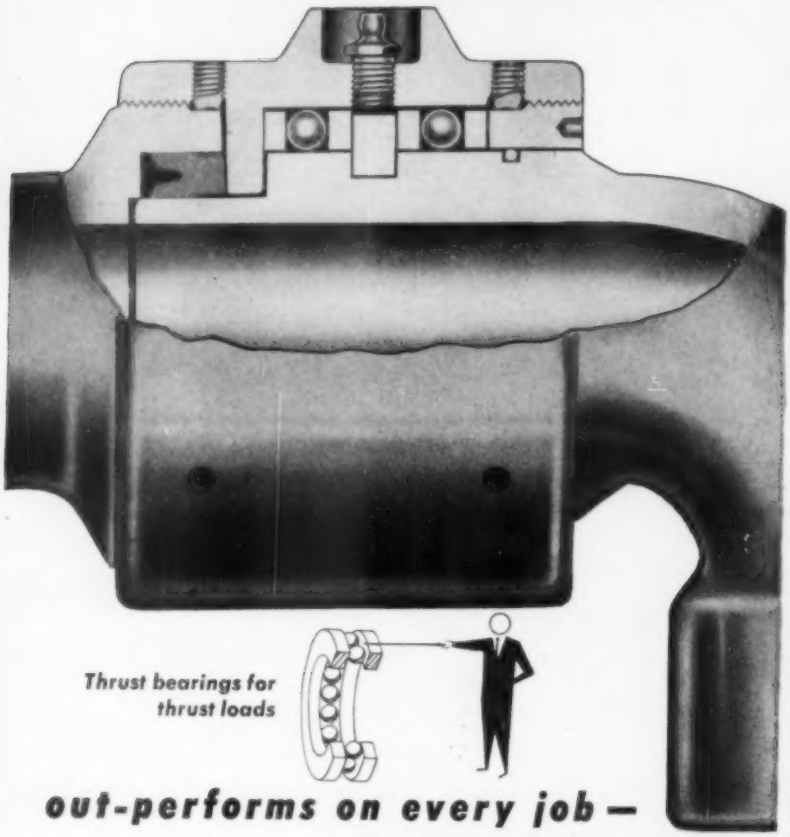
This is your proof that today's leader will still be the leader in the future. Now as always you can rely on Baroid to meet your drilling mud needs.

If your executives, engineers and field personnel are not now receiving full data on new Baroid developments, write today for this new information. Keep up with Baroid and you keep ahead in mud technique!

BAROID

8762

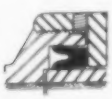
FINEST SWIVEL JOINT ON THE MARKET TODAY



Thrust bearings for thrust loads

out-performs on every job — yet costs no more

Grooved packing for high temperatures or corrosive services.



Lip type packing for high pressures.

Throughout the world you'll find Continental-Emsco Ball Bearing Swivel Joints on vital installations where safety, free-turning and low resistance to flow are essential.

Compare Continental-Emsco ball race design — thrust bearings for thrust loads. Compare the method of sealing against leakage — an isolated packing chamber in which is retained the type of packing most suited to the job. Joint breaks like a union for easy inspection or replacement of packing.

You profit directly from these features — the result of years of engineering know-how built into every Continental-Emsco joint. If you're not already using Continental-Emsco, better send today for latest catalog and prices.

CONTINENTAL-EMSCO

Serving the Oil and Gas Industries ... Worldwide

CONTINENTAL-EMSCO COMPANY

A Division of The Youngstown Sheet and Tube Company

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HOUSTON, TEXAS DALLAS, TEXAS CHICAGO, ILL.

Export Representative, R. J. Eicke & Associates, Inc.
10 Columbus Circle, New York 19, N.Y.

New Literature

SHOWCASE . . .

Diesel-Powered Electric Light and Power Plants. This group of new bulletins describes plants with capacities of 10, 15, and 20 kw. They give detailed engineering specifications on both the generator and diesel engine for each plant. Charts show the electrical output and engine speeds. The bulletins list both standard and optional equipment available with each plant too. **Write or call: Universal Motor Co., Universal Drive, Oshkosh, Wis., for specification sheets on diesel-powered electric plants.**

●

Motor-Driven Controlled-Volume Pumps are pictured and described in 34-page Bulletin 553-1. This bulletin contains complete specifications and latest design features of these positive displacement pumps, designed for precise metering and pumping of corrosive liquids against pressure. It also describes and illustrates standard and modified models and their applications. A special section contains useful data and charts with recommendations for materials selection and usage. **Write or call: Milton Roy Co., 1300 Mermaid Lane, Philadelphia 18, Pa., for Bulletin 553-1.**

●

Phase Conversion System for operating three-phase motors from single-phase lines is the subject of this four-page folder. Illustrating and explaining the advantages of three-phase motors and how they can be operated where only single-phase power is available, the folder includes a table giving cost data on the phase-conversion system for motors with horsepower ratings from 3 to 50 hp. **Write or call: Steelman Electric & Mfg. Co., Box 1127, Kilgore, Tex., for folder, "H-A-S Phase Conversion System."**

●

Corrosion-Resistant Alloys. This 104-page booklet gives up-to-date information on four nickel-base alloys—Hastelloy alloys, B, C, D, and F. It describes chemical compositions, physical, mechanical, and high-temperature properties of the alloys. The booklet also includes a table of the comparative resistance of the Hastelloy alloys to over 250 corrosives commonly handled in petrochemical, and petroleum plants. More-complete laboratory penetration data are included for some of the common corrosives such as hydrochloric, sulfuric, nitric, phosphoric, acetic, and formic acids. These data are supplemented with graphs showing penetra-

WORTHINGTON WATERFLOOD PUMP CONTEST

WIN YOUR VACATION IN BERMUDA

Ten big prizes – closest to industry survey wins

First Prize—Bermuda vacation for two. Seven activity-filled days in the "Isles of Summer." You enjoy six nights at the world-famous Castle Harbor Hotel. Includes transfers, a scenic motor tour, an exciting inter-island yacht cruise, all meals, round trip air tourist transportation from New York City, and the Bermuda Tourist Tax. Transportation in U. S. to and from New York City.

Second Prize—Delta Radial Saw Workshop. 9″ radial saw, guard, anti-kick back attachment, grain fir table, ¾ hp motor included.

Third Prize—Sylvania High Fidelity Console Phonograph.

Fourth Prize—Winchester No. 50 Semi-Automatic Shotgun.

Fifth Prize—Polaroid Highlander Camera.

Sixth Prize—Skil 8¼″ Saw.

Seventh Prize—Camping Tent.

Eighth Prize—24″ Two-Suiter Cowan Luggage.

Ninth Prize—Skil Jig Saw.

Tenth Prize—Philco Clock Radio.

RETURN CARD →

OFFICIAL RULES

1. Turn the page, study and rate the six features of Worthington water-flood pumps using the post-card entry blank on this page.
2. Detach card and mail.
3. To be eligible, entries must be postmarked no later than August 31, 1957 and be received no later than September 10, 1957. In the event of ties, prizes will be awarded to entries bearing earliest postmarks.
4. Contest is open to all residents of the U.S. and its territories, except employees of the Worthington Corporation, its advertising agencies, or distributors, and their families. Contest is subject to federal, state, and local regulations.
5. Entries will be judged on the basis of closest rating to Worthington 1957 power pump survey. Judges' decisions will be final.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 11, Harrison, N. J.

WORTHINGTON WATERFLOOD PUMP CONTEST

WORTHINGTON CORPORATION

HARRISON, NEW JERSEY

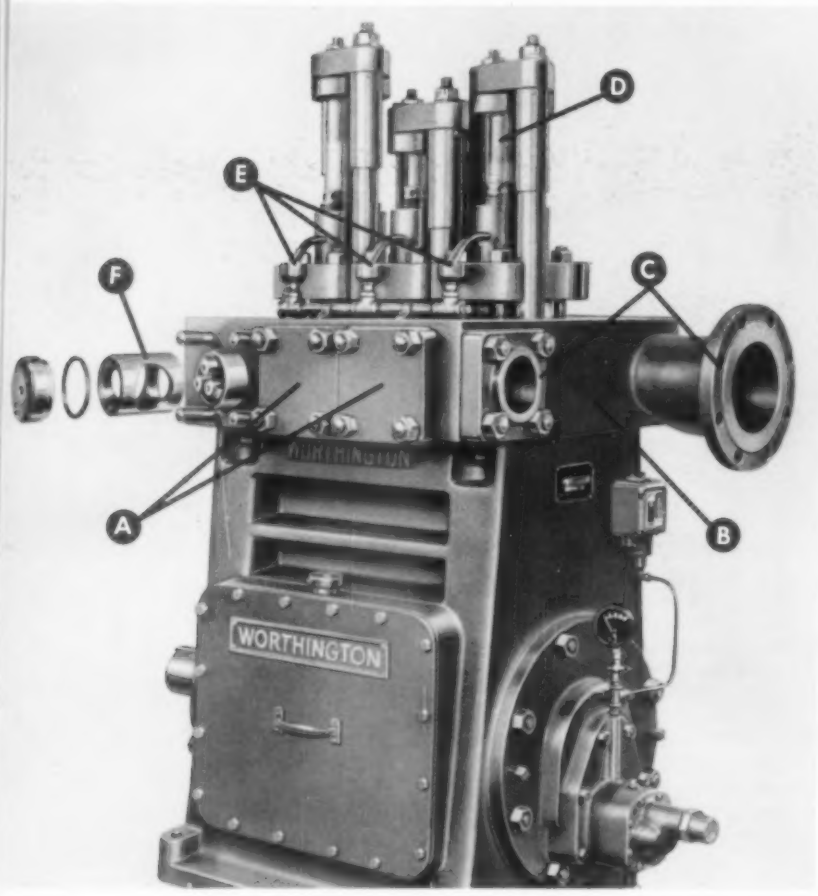
WIN YOUR VACATION IN BERMUDA

HOW WOULD YOU RATE THIS PUMP?

Here's all you do to get in line for one of the big prizes described on the preceding page.

Study the six outstanding features of Worthington waterflood pumps. Then decide how you would rate each one. Is it of limited importance, moderately important, or extremely important? You'll see on the return card below that each feature must be job-rated on a scale from one to ten.

Your answers will be compared with the results of a survey already completed among men who use waterflood pumps and know them intimately. To the ten entries closest to the majority opinion go the ten big prizes.



RATE THESE FEATURES

For each feature mark an X in the box corresponding to your rating of its importance.

A. Individual Bolted Covers for each suction and discharge valve make it unnecessary to disturb pipe connections or remove heavy manifolds to service valves.

B. One-piece Forged Liquid Cylinders containing suction and discharge manifolds for increased strength and corrosion resistance.

C. Flanged and Bolted Liquid End Connections prevent possibility of thread corrosion.

D. Interchangeable Stuffing Box Barrels permit different plunger diameters as pressure conditions change, without buying a new liquid cylinder.

E. Stuffing Box Drain Piping collects packing leakage *before* it stains and corrodes external pump surfaces.

F. Ring Type Double-Ported suction and discharge valves give greater valve area, yet are light enough for operation at modern [redacted] speeds without pounding seats.

Hurry, hurry, hurry! Contest closes August 31, 1957. For complete Waterflood Pump literature, write Worthington Corporation, A&SP Dept., Harrison, New Jersey.

WORTHINGTON

P.7.1.

Here's how I rate the six waterflood pump features:

Of Limited Importance • Of Moderate Importance • Of Extreme Importance

	1	2	3	4	5	6	7	8	9	10
Feature A										
Feature B										
Feature C										
Feature D										
Feature E										
Feature F										

Name_____

Address_____ Company Affiliation_____

City & State_____

P.7.1.

tion rates at various acid concentrations and temperatures.

A separate section of the booklet describes techniques for forging, cold working, machining, grinding, and welding of the alloys. **Write or call: Haynes Stellite Co., Div. of Union Carbide Corp., 420 Lexington Avenue, New York 17, N. Y., for booklet on corrosion-resistant alloys.**

●

Forged Steel Couplets ranging in size from ¼ to 3⅞ in. for branch connections to pipelines, tanks, and pressure vessels are diagramed and described in new four-page Bulletin CP-1-57. It includes complete dimensional and specification data on both screw-end and socket-welding couplets and 90° elbow couplet. The bulletin also describes installation methods. **Write or call: W-S Fittings Div., H. K. Porter Co., Inc., P. O. Box 95, Roselle N. J., for Bulletin CP-1-57.**

●

Semisteel Plug Valves in sizes from ½ to 30 in. are illustrated and described in 43-page revised Bulletin V-203, Rev. 1. The new bulletin includes two pages of photos, drawings, and detailed description of lubricants and lubricating methods. Large cutaway photos show in detail the working parts of four principal types of Rockwell-Nordstrom semisteel valves — two-bolt cover, screwed-gland, bolted-gland and multiport types.

The bulletin includes large easy-to-read specifications tables and photo-illustrated descriptions of all new semisteel models added to the line in the past 4 years. **Write or call: Meter and Valve Div., Rockwell Manufacturing Co., 400 North Lexington Avenue, Pittsburgh 8, Pa., for Bulletin V-203, Rev. 1.**

●

Aluminum Pipe in sizes from ¾ to 10 in. for tank and vessel hookup is the subject of this new four-page brochure. Handy reference tables give sizes and specifications of pipe available through leading distributors across the nation. Photographs illustrate typical applications of the pipe. The brochure gives actual examples comparing costs of similar installations — one using steel piping and the other aluminum. **Write or call: Reynolds Metals Co., 2500 South Third Street, Louisville 1, Ky., for brochure, "Reynolds Aluminum Pipe for Tank and Vessel Hookup."**

●

Drilling Baskets, Grant Models 2490 and 9540, are described and illustrated in this new literature piece. It includes

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Weld Saddles.

HARRISBURG STEEL CORPORATION
Harrisburg, Pennsylvania
Forged Steel Flanges and Seamless Casing Couplings.

VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

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Welding Caps—Dished & Flanged Heads.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels Prevents spillage—easily loaded.

MILLS IRON WORKS, INC.
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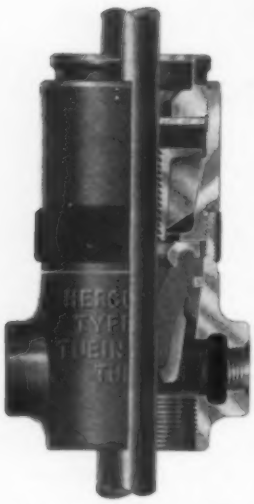
Seamless Swage Nipples, Bull Plugs & Welding Reducers.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

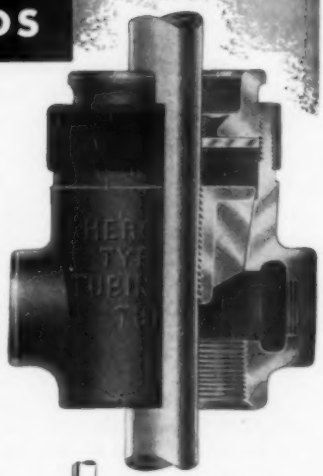
You get the most ECONOMICAL SERVICE from...

HERCULES TUBING HEADS



"TYPE J-5" TUBING HEAD

Ideal for flowing or pumping wells or for well servicing and repressuring projects. Will suspend 2" tubing to 5½" casing up to maximum of 180,000 pounds. Head is full-opening; constructed of pressure cast steel tested to over 4,000 psi. HERCULES original overhead packing arrangement and hinged slips facilitate installation and servicing. HERCULES Neoprene Tubing Stripper (2" - 2½" - 3") may be used in this head on wells flowing intermittently or to wipe tubing. Equipped with safety threads.



"TYPE J-5-S" STRIPPER TUBING HEAD

The dual purpose "Type J-5-S" Stripper Tubing Head is basically a "Type J-5" Tubing Head with a bowl (top section) screwed into the packing nut thread. The hinged slips, packing and packing nut are installed in the bowl (top section) with the tubing stripper in the body (lower section), thus permitting tubing to be run-in or removed under pressure. Test pressure is the same as the "Type J-5" Tubing Head.

Available through all supply stores

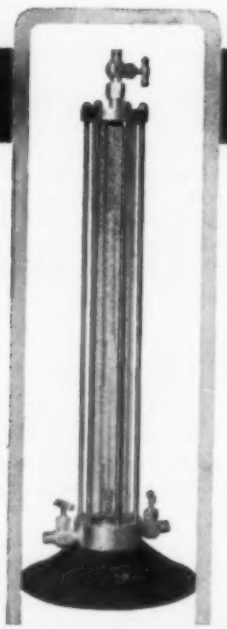
HERCULES TOOL Company

"MANUFACTURERS OF OIL FIELD EQUIPMENT" SINCE 1924

GENERAL OFFICES AND PLANT
TULSA, OKLAHOMA
30 Church Street,
New York 7, N. Y.

Export Representative: Oil Field Equipment Co., Inc.,

PRESSURE HYDROMETER JAR



For obtaining specific gravity of liquefied petroleum gases, such as propane and butane, which under normal atmospheric pressure would evaporate into a gaseous form. Jar withstands operating pressures of 200 psi at normal temperatures. Equipment consist of clear lucite tube, aluminum end caps held by tie-rods and a conical base. Three needle valves allow entry of the sample and adjustment of the liquid level.

N.G.A.A. METHOD NO. 2140-55

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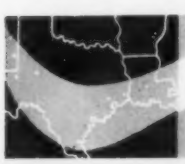
Quitting Time..?

. . . No sir; this ABI man has an important date. A little over an hour ago a drilling superintendent on a Pierce Junction workover called the Brine Service Company in Houston for 400 barrels of super-saturated, Ready-Made brine.

In about 20 minutes this ABI driver will have made his delivery and ABI will add another name to its rapidly growing list of satisfied customers. ABI realizes the importance of keeping appointments on time. When ABI says they'll provide three hour service anywhere along the Texas Gulf Coast, in Louisiana, Eastern New Mexico and West Texas, they mean exactly that. ABI knows time is a valuable commodity in the drilling business.

Call the ABI brine company nearest you and find out for yourself.



Associated Brine Industries

COMPANY	PRODUCING POINTS
Brine Service Div., Corpus Christi Salt Co	Beaumont, Tex.; Pine Prairie, La.
Brine Service Co.	Houston, Corpus Christi
Toland Brine Service, Inc.	Kermit, Tex.
The Brine Co.	Midland, Tex.; Hobbs, N. M.

full descriptions of the tools and specifications for their use. **Write or call: Grant Oil Tool Co., 2042 East Vernon Avenue, Los Angeles 58, Calif., for literature on drilling baskets.**

●

Motor Catalog, Marathon 1957 condensed edition, covers motors from 1/20 through 200 hp.—both general-purpose fractional and integral horsepower motors. The four-page catalog includes slide-base dimensions, diagrams, adapter information, standard modifications, and dimension drawings. **Write or call: Marathon Electric Mfg. Corp., Wausau, Wis., for 1957 condensed motor catalog.**

●

Solvents for Industrial Cleaning. This 16-page technical booklet describes the properties and applications of fluorinated hydrocarbon solvents in industrial cleaning jobs, ranging from immersion and vapor cleaning of electrical motors and electronic equipment to general laboratory maintenance. It contains data on comparative performance of the fluorinated compounds, chlorinated solvents like methyl chloroform, carbon tetrachloride, and trichlorethylene, and straight hydrocarbon solvents such as naphtha and gasoline. **Write or call: E. I. du Pont de Nemours & Co., 8531 Nemours Building, Wilmington, Del., for booklet on solvents for industrial cleaning.**

●

Properties of Selected Commercial Glasses. Sixteen-page Bulletin B-83 discusses at length the mechanical, thermal, electrical, and chemical properties of glass. The bulletin also includes viscosity - temperature curves for several commercial glasses and heat-transmission data. **Write or call: Technical Products Div., Corning Glass Works, Corning, N. Y., for Bulletin B-83.**

●

Chemical-Resistant Sheet is the subject of this new 18-page illustrated booklet giving detailed information on a flexible thermoplastic, chemical-resistant lining for storage tanks, processing tanks, medium-to-large-diameter pipe and fittings, fume ducts, and hoods. The booklet includes data on properties, materials, equipment, and procedure for installation, care and repair of linings and storage of the sheet. It also gives instructions on preparation of a tank for lining, application of the sheet, and the procedure for making joints. **Write or call: Plastics Sales Dept., Dow Chemical Co., Midland, Mich., for booklet on Saraloy 898.**

PAYNE PEOPLE GET AROUND

We must move far and fast to keep up with the ever-increasing demand for Payne Blowout Preventer Operating Units. As drilling depths go deeper on land and offshore, the need for more protection against hazardous blowouts has increased. Payne units are the only units designed specifically for the many combinations of power, volume and pressure required by the excellent preventers in use today. Any preventer closes (and opens) promptly and positively when the new fast-acting automatic Payne Pump Accumulators go to work. They use no expensive *bladders* or *diaphragms* – maintain a big 2,000 psi reserve for the safest, most economical protection available. More drilling people every month are choosing Payne reliability, and we are moving far and fast to do a better job of serving them.

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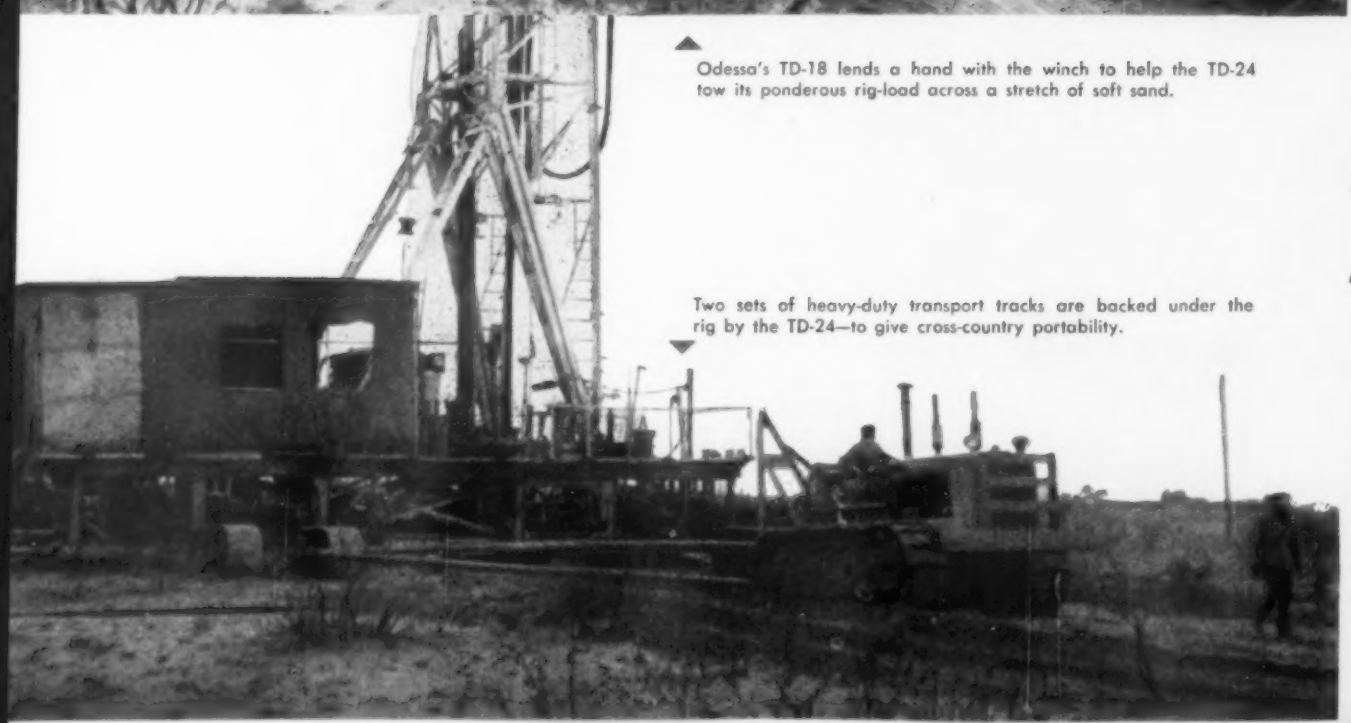
Export: R. S. Stokvis & Sons, 17 Battery Place, New York 4, New York

How Texas Rig-Mover SAVES

Odessa's TD-18 lends a hand with the winch to help the TD-24 tow its ponderous rig-load across a stretch of soft sand.



Two sets of heavy-duty transport tracks are backed under the rig by the TD-24—to give cross-country portability.

$550.00 and 1½ DAYS

...towing 100-tonner to new drill site!

Drilling has hardly stopped before Odessa Rig & Equipment Co., Odessa, Texas, has jacked-up this 127-foot, 200,000-lb L. C. Moore portable drill rig. Then they position the transport tracks, winch the 100-ton outfit off the hole—and go!

By teaming job-speeding International TD-24 and TD-18 crawlers, this rig-moving firm saves $550.00 in labor, plus 1½ days of vital drilling time—on a ¾-mile move. The rig is left intact—in drill-ready condition.

"You can't beat big International crawlers for rig-moving," declares owner C. D. Cree. "My TD-24 and TD-18 give me the power to move 125-ton rigs across Texas terrain in record time."

Compare the huge extra drawbar pull you get from a TD-24—on the turns or straightaways. Only the TD-24 gives you famous Planet Power steering with full-time "live" traction-matched power on both tracks. Measure International crawler Cerametallic clutch action, for operating and servicing ease—power-transfer efficiency—long life. Inspect International's new full-floating track roller seals with the 500-hr lube interval. Examine the new full-flow lube oil filters with 480-hr capacity. Prove flush-deck safety, "Control-Tower" visibility, new booster steering, as production aids.

See your International Construction Equipment Distributor for a new Bonus-Powered Crawler demonstration

Besides helping pull in tough spots, the TD-18 prepares the route to the new site, levels the site and digs the pits, and dozes a protective cover of dirt over small pipelines on the tow-route!

INTERNATIONAL® CONSTRUCTION EQUIPMENT

International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill.

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

EQUIPMENT MEN . . . in the News

Campbell Reappointed to Oilwell Tubular Sales

T. L. CAMPBELL

Thomas L. Campbell has been appointed assistant manager, tubular sales, at Los Angeles for United States Steel Corp.'s Oil Well Supply Division, according to D. S. Grubbs, California area manager of the division. Campbell was employed in 1937 at Wilmington, Calif. He left Oilwell in 1948, returning in 1952 as assistant district manager at Long Beach. In 1955 he was appointed assistant manager, tubular, at Los Angeles and in 1956 assistant manager, production equipment sales, Long Beach.

Goodyear Names Special Oil Representative

Raymond H. Dunn has been appointed special petroleum representative at Dallas, Tex., for The Goodyear Tire & Rubber Co., according to O. E. Miles, sales manager, tire division.

A truck tire salesman in the Oklahoma City sales district since 1954, Dunn joined the firm's production squadron at Akron in 1947. He became an assistant service representative at Oklahoma City in 1948. While with that district, he served as field sales representative, with headquarters at Clovis, N. M., from 1949 to 1954.

Beaird Elects Tullis Ass't. General Manager

J. L. TULLIS

John L. Tullis, vice president of sales, has been advanced to vice president and assistant general manager of The J. B. Beaird Co., Inc., according to J. Pat Beaird, president. Tullis was elected a director of the company in February of this year when five officials of American Machine & Foundry Co. were named to the board following the affiliation of Beaird as a member company of AMF.

In his new capacity, Tullis will have executive responsibility for all phases of Beaird operations. Joining the Beaird sales organization in 1947, Tullis was general sales manager for several years before his elevation to vice president and general manager of sales in 1954.

Halliburton Names Paramore Southern Region Vice Pres.

Edwin L. Paramore has been named a regional vice president by Halliburton Oil Well Cementing Co. The new southern region vice president is responsible for Halliburton operations in the Shreveport, New Orleans, Houston and Corpus Christi divisions of the company.

Following oil-field work in the Permian basin, Paramore joined Halliburton in 1936 as driver of a cementing truck. Following field assignments in New Mexico, Texas, Oklahoma, Kansas, Illinois and Louisiana, he transferred to Halliburton's Duncan, Okla., headquarters in 1956 as southern region manager.

Du Pont Creates New Sales District, Reassigns Five

The industrial chemicals sales section of Du Pont's polychemicals department recently created two new sales districts in the Pittsburgh and Houston areas. Richard C. Cecil and Robert B. Micklewright, formerly with the Wilmington office, have been assigned, respectively, to the new districts as sales representatives.

The following sales representatives also have been reassigned to other districts: Edward W. Smith, formerly in Detroit, goes to the Philadelphia territory. Robert L. Harbour, now in Akron, also becomes the sales representative for the Detroit district. Thomas J. Coonan takes over the San Francisco territory in September.

H. K. Porter Promotes Counselman, Adds Haines

E. G. Counselman, Washington representative, H. K. Porter Co., Inc., has been appointed manager, industrial sales with headquarters in New York. William E. Haines, director of industrial defense, Department of Commerce, has been named Washington representative to succeed Counselman.

Haines has had wide experience in both industry and government. He also has been associated with National Association of Manufacturers and Hercules Powder Co.

Fisher Governor Customers Visit Marshalltown Plant

A group of 32 representatives from the chemical and petroleum industries of the Houston and Corpus Christi areas of Texas made a 2-day visit to the Fisher Governor Co. plant at Marshalltown, Iowa. They studied Fisher production operations, after which research and engineering department personnel spoke on developments in the Houston and Corpus Christi areas.

Companies represented were Rohn & Haas, Neches Butane Products Co., the Shell Oil Co., Foster Wheeler Co., Crown Central Petroleum, Brown & Root, Inc., LaGloria Oil & Gas Co., Union Carbide, the Dow Chemical Co., Eastern States Petroleum, Tellepsen Petro-Chemical Co., Fish Engineering Corp., Texas Butadiene & Chemical Corp., Texas Gulf Sulphur Co., Columbia Southern Chemical Corp., Central Power & Light Co., Celanese Corp. of America, American Chemicals Corp., Creole Petroleum Co., American Oil Co., the Pure Oil Co. American Chemicals Corp. and the Lummus Co.

American Meter Co. Names Stevenson Vice President

STEVENSON

George W. Stevenson, manager of West Coast operations, has been appointed as vice president of American Meter Co. and will continue in charge of sales and manufacturing activities in Washington, Oregon, California, Arizona, Nevada, Idaho and the Hawaiian Islands, according to W. G. Hamilton, Jr., president. American Meter manufactures a complete line of measurement equipment for the gas, oil, and chemical industries at 11 plants in the United States and Canada.

Stevenson joined American Meter in 1928 and was appointed sales engineer with headquarters in Los Angeles in 1936. He was promoted to assistant manager of the Los Angeles factory in 1941, manager in 1951, and manager of West Coast operations in 1954.

Totco President Presides Over Field Service Talks

H. H. Peters, president, Technical Oil Tool Corp., has recently returned from a series of three meetings in the Mid-Continent area. Service meetings were held with all Totco field service personnel of the Mid-Continent and Canada, in Houston, Oklahoma City and Odessa.

In these meetings, presided over by Peters and Gene McConnell, vice president of Totco's Mid-Continent division, the need for consistent reliable drilling records developed as the primary field problem. Recent improvements in instruments were demonstrated and discussed by McConnell. Progress on the development and field testing of new instrumentation was reported by Peters.

Kerotest Names Gee to West Coast Sales Post

Boyd N. Gee has been named West Coast sales representative of the steel valve division of Kerotest Manufacturing Co. Gee has been with Kerotest 7 years, of which 1½ years were spent in the Midwest territory and the balance of the time in the West Coast territory. Gee has most recently been assigned to the brass valve division.

Prior to joining Kerotest, Gee was with General Valve Service Co. and before that was with the valve division of Reed Roller Bit Co.

McCullough Opens Service Branch at Woodward, Okla.

The opening of a service branch at Woodward, Okla., has been announced by O. J. McCullough, vice president of McCullough Tool Co.

Branch Manager John R. Power, who transferred to Woodward from McCullough's Healdton office, is in charge of operations at the new branch. Serving as sales representative for the area is Robert E. Rowe, who also transferred from Healdton.

The Woodward service branch is fully equipped to serve the area with all electric wire-line services offered by McCullough.

McNamar Ships Giant Vessel to Union Plant

One of the largest single pieces of equipment ever to be shipped from Tulsa left by rail recently from McNamar Boiler & Tank Co. Three special triple truck and two standard double truck flat cars were required to ship a rich oil demethanizer to Union & Exploration Co.'s Unatex gasoline plant, near Eunice, La.

The vessel, 162 ft. long by 9 ft. in diameter and weighing 250,000 lb., was fabricated by McNamar for Fluor Corp., Ltd., of Houston, contractors for the new Union plant.

National Supply Appoints In California Division

J. D. McCLENDON

Jess D. McClendon has been appointed division sales manager, with headquarters at Torrance, Calif., by National Supply Co. He succeeds Charles T. Reichert, now in charge of the London office of the export division. John R. Mefford replaces McClendon as division tubular manager at Los Angeles. Charles A. Chandler has been appointed district manager of both the southern and northern districts, with headquarters at Torrance.

J. R. MEFFORD

C. A. CHANDLER

McClendon joined National Supply in 1925 and has served as store manager at Bakersfield, Huntington Beach, Long Beach, and Venice; and supervisor of stores and assistant division sales manager in the California division.

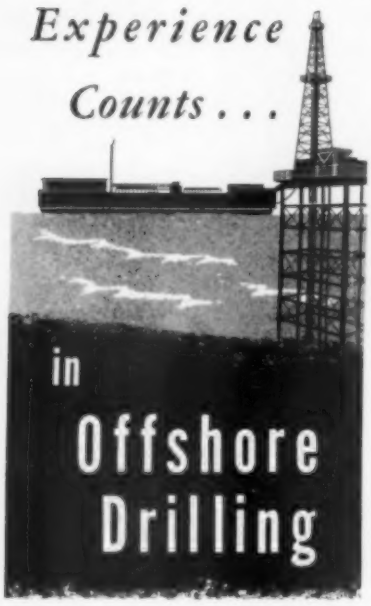
Mefford started with the company in 1947 at the Bakersfield store and has been a sales representative at the Los Angeles office since 1949. Chandler began with the company in 1935 and worked at the Avenal, Taft, Venice, Long Beach, and Wilmington stores. He has served as district manager of the southern district since 1947.

Sivalls Tanks Elects Sivalls and Kroeker

C. T. Sivalls has been elected president and S. P. Kroeker executive vice president of Sivalls Tanks, Inc. Sivalls replaces I. W. Lovelady who retired recently. Lovelady will continue to serve on the board of directors.

Sivalls had served as vice president of Sivalls Tanks, Inc. since its organization in 1947. Kroeker has also been with Sivalls Tanks since 1947. In addition to his duties as secretary and treasurer and assistant general manager, he served as chief engineer and purchasing agent.

Sivalls Tanks has sales and service representatives in Hobbs, Abilene, San



and so does . . .

EQUIPMENT

Reading and Bates operates two Levingston offshore drilling tenders with National Supply Co. Type 130 rigs, capable of drilling to a depth in excess of *20,000* feet in water *100* feet deep.

DEPENDABILITY

Reading and Bates is a dependable contractor with seasoned, experienced men operating their rigs. Contracts are fulfilled to the last letter.

KNOWLEDGE

Reading and Bates are specialists in offshore drilling. Their basic knowledge of offshore drilling problems, plus their wide experience, assures you of a job well done.

READING & BATES
OFFSHORE DRILLING CO.

- 1502 Philtower Bldg., Tulsa, Oklahoma
- 820 Maritime Bldg., New Orleans, Louisiana

Angelo, Borger and Fort Worth. General offices and plant are in Odessa.

Aero Design Appoints Director of Marketing

TOM HARRIS

Tom Harris has been appointed director of marketing for Aero Design & Engineering Co., according to R. T. Amis, president. Harris comes to Aero Design from American Airlines, where he was director of freight sales from 1955 until his appointment with Aero Design. Prior to joining American, Harris was with American Overseas Airlines.

Frank W. Murphy Appoints Moore as Sales Engineer

W. M. (Bill) Moore has been appointed as sales and service engineer for the West Texas and New Mexico area of Frank W. Murphy Mfr., Inc., Tulsa. Moore has spent the past 3 years in various manufacturing departments of the Murphy safety switch organization.

Toth Appointed De Laval Turbocharger Sales Mgr.

MICHAEL TOTH

Michael Toth has been appointed manager of turbocharger sales, according to H. G. Bauer, vice president, De Laval Steam Turbine Co., Trenton, N. J.

Prior to this appointment Toth was serving as acting manager of turbocharger sales since February 1957. He joined De Laval in 1949.

Sargent Engineering Expands Plant Facilities

Sargent Engineering Corp. has expanded manufacturing facilities in its Huntington Park, Calif., plant. With more than 300,000 sq. ft. under roof, the new expansion will add substantially to the production facilities for conventional and hydraulic deep-well pumping systems.

According to E. J. Sargent, executive vice president and chairman of the board, demand has steadily increased since the corporation opened its 21 supply stores in California and the Mid-Continent.

Tubular Lining Names South Louisiana Sales Mgr.

Don Henderson has been appointed southern Louisiana regional sales manager for Tubular Lining Corp., Houston applicator of plastic linings for oil-field tubing. Henderson has been with Tubular Lining Corp. since the firm was organized 18 months ago. He was most recently employed in the engineering department as the final phase of the company's training program. This program gives background training in the autotronic lining method of lining oil-field tubing with plastic, recently developed by Tubular Lining Corp.

Bethlehem Supply Named Distributor by Lone Star

Bethlehem Supply Co., a subsidiary of Bethlehem Steel, has been named as a distributor of oil-field casing and tubing manufactured by Lone Star Steel Co., Dallas. According to E. B. Germany, president of Lone Star, it is a sales arrangement covering only oil-country goods.

Walter T. Moreland, vice president, sales, for Lone Star, said arrangements are under way to begin a training program to introduce Lone Star products to Bethlehem personnel. Allocations to the new distributor may not become sizable until Lone Star's new stretch reducing mill and fifth open hearth furnace are completed and in operation.

Oilwell Appoints in Central Midwest Area

Richard C. Sennett has been appointed assistant district engineer, machinery and equipment sales and service, Oil Well Supply Division, United States Steel Corp., Wichita Falls, Tex., according to William Miskimins, Central Midwest area manager of the division.

Henry W. Harless has been named store manager at McCamey, Tex., and Allen C. Heard has been appointed field representative at the same location.

Sennett was employed in 1956 by Oilwell as a junior engineer at Corpus Christi, Tex. Harless joined Oilwell in 1954 at Odessa, Tex., and became the division's field representative at this location in 1955. Heard, who joined the division at Odessa in 1950, was

appointed field representative at that location in 1952 and in 1955 was named manager of the Oilwell store at McCamey.

Continental-Emsco Names Gregg, Murphy, Smith

R. F. Gregg and L. D. Murphy have been appointed division oil country tubular representatives by Continental-Emsco Co., and D. L. Smith has been named division line pipe representative.

Gregg will headquarter in Tulsa and will serve the Kansas-Oklahoma-North Texas division. Smith will serve this same division but will headquarter in Continental-Emsco's Kansas City office. Murphy will work out of Shreveport, La., covering the Arkansas-North Louisiana-Mississippi-West Texas division.

Atlas Pipe Adds Martin To Houston Sales Force

Carroll Martin has joined the sales force of Atlas Pipe, Inc., in Houston, according to W. H. Becker, president. Martin presently is undergoing an intensive familiarization and training program in Atlas Pipe's several installations in Houston and Corpus Christi.

Midwestern Engine Named FWD Dealer for Oklahoma

Midwestern Engine & Equipment Co., Inc., Tulsa, has been appointed a new Four Wheel Drive Auto Co. dealer for sales, parts, and service of FWD trucks.

G. F. DeCoursin, FWD vice president-sales, announced that Midwestern Engine & Equipment will be exclusive FWD dealer in the State of Oklahoma. O. E. Murrey is president of the new FWD dealership.

FWD, which recently opened a new southwestern sales and service center at Duncan, Okla., has been manufacturing specialized heavy-duty trucks since 1910. The firm is headquartered at Clintonville, Wis.

Garlock Appoints Strobel As Denver Sales Engineer

John R. Strobel has been appointed sales engineer at Garlock's Denver branch, according to J. B. Sewell, vice president in charge of sales for The Garlock Packing Co., Palmyra, N. Y.

Strobel's territory consists mainly of Nebraska and Arizona. He was previously with Black & Decker Manufacturing Co. as a sales representative.

Metallurgy Improves New Offshore Derrick

Lee C. Moore Corp.'s new lightweight offshore drilling mast is shown aboard Coral Drilling Co.'s "Mr. Arthur," just before the mobile offshore drilling platform headed for its first assignment in the Gulf of Mexico. By strategic use of U. S. S. Man-Ten Steel,

one of the important high-strength steels, engineers of the Moore firm cut 7½ tons off the weight of the 140-ft. portable mast. Developed by United States Steel and supplied through the district office of its Tennessee Coal & Iron Division at Tulsa, U. S. S. Man-Ten Steel went into points of greatest stress, which figured out to about 34 per cent of the total steel. The result was a mast about 15,000 lb. lighter than, yet just as strong, as a similar size unit built entirely of carbon steel.

Ever-Tite Coupling Opens Midwestern Sales Office

Ever-Tite Coupling Co., Inc. has opened a midwestern sales office in Cincinnati, Ohio. Roy W. Gronauer, midwestern sales manager and sales engineer, will make this office his headquarters.

F & P's Houston Branch Moves to New Building

Fischer & Porter Co. has relocated its Houston branch in a building especially constructed for its use on Richmond Avenue. The one-story building covers 5,200 sq. ft. Sales offices and a display area occupy 3,200 sq. ft., the remaining 2,000 sq. ft. being allotted to warehouse and shop areas.

In addition to stocking Fischer &

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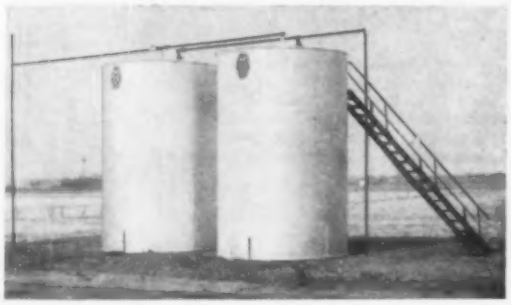

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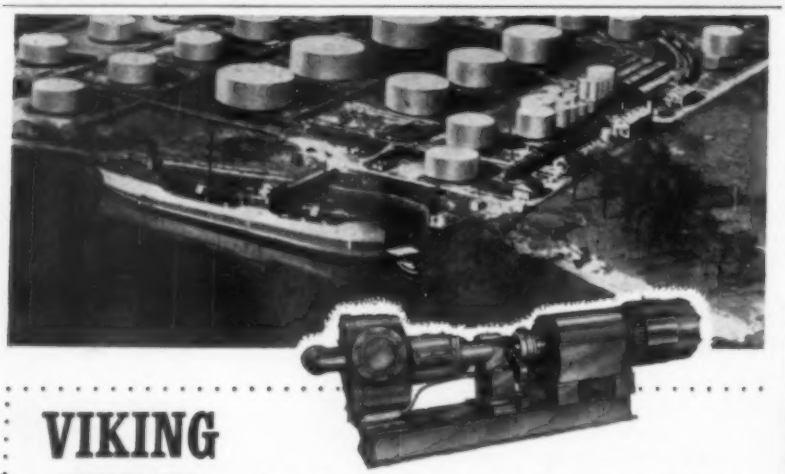

VIKING PUMP SUCCESS STORY

Viking Pumps have played an important part in the successful operation of this huge tank terminal at Galena Park, Texas, near Houston. General American Transportation Corporation handles 58 different liquid products there, using Vikings. Besides storage, they blend, barrel, drum and package liquids for customers. Their business continues to grow. Now they have added this new Viking, with 63,000 gallons per hour pumping capacity. It will load barges and ships, and do general transfer work, pumping benzol, gasoline, oils and other liquids.

Let Viking Pumps help your business grow, too. For information, see your nearby distributor, or write for bulletin section Ct.

VIKING PUMP COMPANY
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Porter products, the new building affords facilities for assembling and testing chlorinators, calibrating flowmeters, secondary instruments and controllers, as well as for the machining and repair of instruments.

Johnston Pump Elects Brown as Vice President

PERRY BROWN

Perry Brown, former plant works manager, has been elected a vice president of Johnston Pump Co., Pasadena, Calif., according to A. H. Miller, vice president and general manager. Johnston Pump Co., a division of The Youngstown Sheet & Tube Co., is one of the leading manufacturers of vertical pumps.

Bradford Transfers Myers, Neff, Dawson and Yerkes

Bill Myers has been transferred from Albany to Coleman, Tex., to replace I. N. Witherspoon as branch manager for Bradford Supply Co. Witherspoon has been named assistant district credit manager at Wichita Falls.

Also transferring from Albany to Coleman is Michael Neff, who will be field representative in the Coleman area replacing Tommy Dawson who will serve at the Coleman store headquarters.

Moving to Albany as field representative is Jim Yerkes, transferring from Ada, Okla. Yerkes was employed by the company in its Pennsylvania and New York operations prior to transferring to Ada several months ago.

Unit Rig Names Tomlinson Ass't. Chief Engineer

G. A. TOMLINSON

T. S. MOUGHON

G. A. Tomlinson has been appointed assistant chief engineer of Unit Rig & Equipment Co., according to J. L. Vint, Jr., president.

Tomlinson replaces T. S. Moughon, who is now district manager, New Orleans.

BrakeSol Treating Engineers Study Paraffin Control

At the semiannual sales and engineering conference of BrakeSol, Inc., held recently in Oklahoma City, sales engineers presented papers relative to new and outstanding methods of paraffin control in their respective areas. Attending were: (front row) E. W. Davidson, Kilgore, Tex.; Lester P. Brake, president, Oklahoma City; M. F. Howard, Lovington, N. M.; W. E. Ramsey, Carmi, Ill.; Doug Hall, Edmonton, Alta.

Back row: W. J. Boulden, Casper, Wyo.; Clyde P. Curtin, Oklahoma City; Jeff Villines, Ardmore, Okla.; Harvey D. Lowe, general manager, Oklahoma City; K. D. Bowdon, Odessa, Tex.; Buford Cranford, chief treating engineer, Oklahoma City; Max Campbell, Pampa, Tex.; Elvin B. Grimsley, New Iberia, La.; Cecil C. Blackwell, Houston; R. L. Gibbins, special representative, Dallas; and Tom McNaughton, Fort Morgan, Colo.

Napko Appoints Mileti As Technical Director

Otto J. Mileti, Jr., has joined Napko Corp. as technical director, according to Ed D. Konken, president. Mileti formerly was laboratory supervisor of The Schaefer Varnish Co., Louisville, Ky. He has been active in the paint industry for 11 years.

Baroid Appoints Evans, Alfred and Gossage

R. H. EVANS

Rufus H. Evans, Jr., has been appointed by Baroid Division, National Lead Co., as training engineer of the Baroid well-logging unit which was developed by Barnsdall Oil Co. in 1939, and assisted in training the industry's first well-loggers in that year.

George H. Alfred has been named well-logging district superintendent in North Texas with headquarters in Wichita Falls, Tex.; and Dan Gossage was appointed district superintendent in Southeast Louisiana, with offices in New Orleans.

J & L Supply Transfers Bates to Borger, Tex.

Carl J. Bates, Jones & Laughlin Supply Division, has been transferred from Great Bend, Kans., to Borger, according to W. L. Wolfe, vice president, sales, Tulsa.

Bates, who joined J & L in 1955, has worked at Tulsa, Beaumont, Tex., and Great Bend.

Hood, Armour Promoted By Republic Supply

R. J. Hood, Jr., has been promoted to director of purchases and material by Republic Supply Co. Appointed as purchasing agent is William J. Armour.

Hood joined Republic Supply in 1954, coming from Brown & Root, Inc., where he was a field purchasing agent. Armour joined Republic in 1954, starting at the Oklahoma City warehouse.

Beckman Names Klees to Process Instruments Post

R. E. KLEES

Appointment of Robert E. Klees as advertising and sales promotion manager for the process instruments division of Beckman Instruments, Inc., Fullerton, Calif., has been announced by Division Manaager M. K. Howlett. Klees will be responsible for all promotional activities of the division which manufactures a broad line of continuous-operating analytical instrumentation for the monitoring and control of industrial processes. He will report to Sales Manager Frank Newman.

Klees joins Beckman after 6 years as advertising manager and assistant to the general manager of advertising and public relations for Bakelite Co. In this capacity he directed promotional activities for Bakelite products in all markets, including the electronics, chemical, petroleum and petrochemical industries.

Charles Wheatley Appoints North Texas Sales Manager

Paul A. Wallen has been appointed as new area sales manager for Charles Wheatley Co., Tulsa. He will cover the North Texas territory from headquarters in Wichita Falls, Tex. For 3 years Wallen was office manager for Republic Supply Co. of Tulsa and Bartlesville. He was also associated with Phillips Petroleum Co.

Johnston Testers Establishes Houston Service Center

A new installation that gives greater impetus to the service offered by Johnston Testers, Inc., in oil-well formation and casing testing has been put into operation in Houston. The facilities serve as the new Houston district service center and positions the company better to serve oil operators in the areas north, northeast and northwest of Houston. The district center serves an area from Livingston south to the gulf and from Liberty on the east to near Columbus on the west. Johnston's Houston district manager is Dale Ledbetter. Testing specialists working out of the center are Sam Arthur, W. E. Kirkland and J. B. O'Neal.

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TYPE H4 ANCHOR

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Completely automatic in operation, the H4 incorporates a body designed for unusually large bypass area and tremendous holding power. It has a husky fishing connection on top. Case hardened piston slips are retained by a stainless snap ring that holds the slips in retracted position while going in or pulling — keeps the slips from dragging on the casing wall.

We recommend the H4 for holding down production-type packers in acidizing, fracturing or other below packer pressuring operations. The H4 not only improves circulation, but speeds up operations and cuts down maintenance costs.

Guiberson H4 Anchors are individually tested and available in a full range of casing sizes.

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EXPLORATION

A Blowout Points Up A Lesson

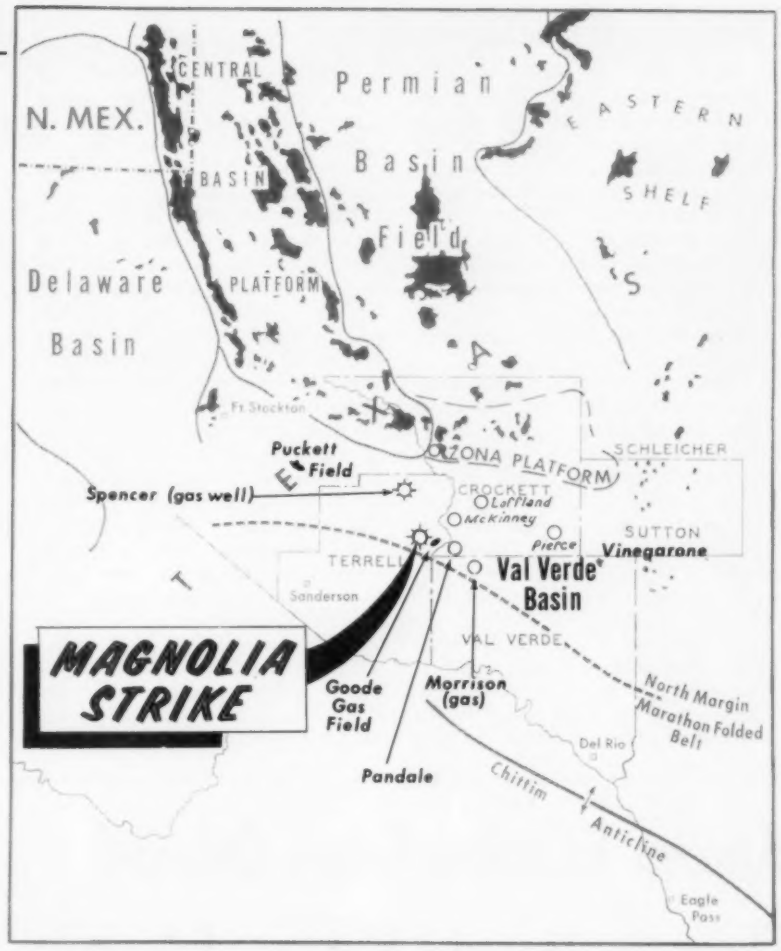
By Frank J. Gardner

LAST WEEK $450,000.00 went up in smoke. It happened in Terrell County, in far Southwest Texas, when Magnolia Petroleum Co. and Western Natural Gas Co. 1 Brown-Bassett, a 15,000-ft. wildcat, blew out and burned. Magnolia estimated the loss and said that the fire ". . . may be a good thing if it makes some people realize the risks taken by the . . . industry in looking for new fuel supplies."

A lesson for oil finders . . . Magnolia has a point. But there's another lesson to be learned in Terrell County—a lesson for oil finders. If that explosion doesn't jar the oil-finding fraternity out of its apparent lethargy concerning Southwest Texas, nothing will. For too many decades now, the vast sweep of ranch country from Pecos County southeast across Terrell, southern Crockett, Val Verde, and Edwards counties on into the expansive Edwards Plateau country, has lain dormant (or nearly so) as far as wildcatting is concerned.

An entirely new producing province lies before us here. Its limits, both geological and geographical, are nebulous. Too little subsurface dope is available from the limited drilling for any geologist to delineate it. It is vaguely referred to as the Val Verde basin, the "southern lobe" of the Midland-Permian basin, or simply as "the Val Verde country." It is believed to be connected to the huge Delaware basin to the northwest via the Sheffield channel. But with new wildcats and more logs, West Texas geologists will work it out. Meanwhile, enough has happened to give a glimpse of things to come.

At a blowout well . . . For one thing, the blowout itself is significant. The gas and distillate roared out of the Devonian, where the Magnolia well



A NEW producing province is shaping up in far Southwest Texas as wildcatters probe the Val Verde basin.

was drilling at 12,407 ft., and an entirely new producing horizon had been found. Located in Section 218, Block Y, TCRR Survey, the discovery lies only 2 miles northwest of Goode Ranch gas field. This old area was first found in 1931 by Ohio Oil Co. 1 Goode, a 6½-M.M.c.f. gasser from Pennsylvanian sand at 5,606-12 ft. In 1937 it was drilled deeper to 9,140 ft. and abandoned. Western Natural reopened the field in 1949 at its 1 Hoge and drilled two more gas wells on the Banner ranch between the Hoge and Goode wells. Development had lagged until Magnolia spudded the Brown-Bassett wildcat, but if Western Natural's estimate of 75,000 M.c.f. per day from the blowout well is any criterion, a discovery of great importance has occurred.

The only other production ever found in Terrell County lies at Spencer field, about 20 miles northwest of Goode field. Here, Humble Oil & Refining Co. completed its 1 Blackstone in 1953 as a small gas well from Wichita-Albany (lower Permian) at 3,400 ft.; the field has not been developed, but Humble found the Devonian at 12,160 ft. before plugging back to 3,751 ft. for completion.

To the southeast, in Val Verde County, Morrison gas field was a 1956 Ellenburger strike at 14,000 ft. Across the county, at Vinegarone, Humble and Phillips Petroleum Co. have finished seven good gas wells in the Strawn-Pennsylvanian at depths of 9,500 to 10,400 ft. for potentials ranging from 17,500 to 55,000 M.c.f. gas per day.

To the northwest, in Crockett County, four fields should be considered as straws in the wind. These are: Pandale, a 1953 gas discovery from Ellenburger at 13,808 ft.; McKinney, a small 2,000-ft. Permian gas field found in 1952; Loffland, a one-well Permian oil pool at 1,070 ft., found in 1947 but now abandoned; and Pierce, a one-well gas field from Ellenburger at 11,800 ft. with no reported production to date. While not enough in themselves to get "all shook up" about, these small fields should point the way to future exploration in the Val Verde basin.

Editor's Introduction . . .

In a series of recent luncheon meetings in San Antonio, the South Texas Geological Society took a good long look at the newest and most important exploration phenomenon that has emerged in the South Texas area in the last 20 years. This is the chain of deep Edwards-Lower Cretaceous gas and condensate fields that has been forged across the waist of LaSalle, McMullen, Atascosa, and Karnes counties at depths exceeding 10,000 ft.

Things move fast along this trend and since these talks were given, the play has produced a new strike in Karnes County and a possible one in Live Oak County. These discoveries, coupled with the recent revelation of a deep salt core at Pescadito in Webb County's Lower Cretaceous section, have whetted exploratory interest clear across Southwest Texas.

In this, Part 1, three papers cover the earlier shallow Edwards and its influence on the new trend, geological thinking on the deep Edwards itself, and drilling problems involved in reaching the Edwards. Part 2, to appear next week, is a geophysical study of this great regional belt of Lower Cretaceous production, authored by W. Lee Moore of Petty Geophysical Engineering Co.

The Edwards of course is no newcomer to Texas oil production for it was the prolific reservoir rock at famous old Luling and Darst Creek fields in Guadalupe County and has poured millions of barrels of oil into the oil tanks of Texas oil operators. That was in the twenties. During and after World War II, a new Edwards trend appeared southwest of San Antonio in Atascosa and Frio counties, centering around Imogene, Jourdanton, and Charlotte. This was fairly deep production, 7,000 to 8,000 ft. Only in the last 4 years has the really deep campaign forged ahead successfully.

The Journal felt that these informal presentations warranted publication as a definite contribution to South Texas' geologic literature. Here, then, is the essence of the important Edwards symposium.

South Texas

Part 1

Known Existing Traps Offered Clues to Deeply Hidden Edwards

By R. M. Knebel and F. C. Jones

EACH of the known Edwards lime fields of Atascosa County, Texas (Fig. 1), produces from the upthrown block of an up-to-the-southeast fault. Since all the fields are similar structurally, only one, Pleasanton, a typical Edwards field, will be discussed in detail.

Pleasanton Field

Pleasanton field was discovered in January 1951, with the completion of Lone Star Producing Co.'s 1 Sara E. Ferry (Fig. 2). The Edwards lies at an average depth of minus 7,700 ft. with an approximate surface elevation of 375 ft. Displacement on the up-to-the-southeast fault is in excess of 400 ft. This places the Edwards against impervious younger beds providing an effective seal for hydrocarbons.

The areal extent of this reservoir is about 885 acres and its 200 ft. of vertical closure is divided into an approximate 165-ft. gas cap and an underlying 35-ft. oil column.

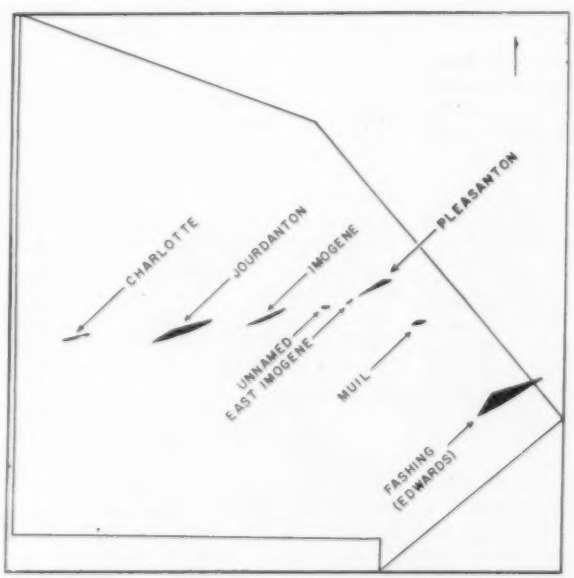
The Edwards in this field is a tan, sucrosic, fossiliferous limestone, and has an average porosity by core analysis of 15.6 per cent. Its permeabilities range from 0 to 6,000 md. with an average of 4. Connate water content is 22 per cent.

The water-oil contact in this field is minus 7,800 ft. This was arrived at through core analysis and electric-log interpretation.

A cross-section of the field (Fig. 3) reveals production in the Carrizo-Wilcox sand at a shallower depth and on the same fault block. This, too, is typical of Edwards fields in the county.

Because of rapidly increasing gas-oil ratios early in the operating life of the first wells drilled, a pressure-maintenance program was decided upon. The field was unitized, and in November 1953, work was begun on a secondary-recovery program. A gas-cycling plant was completed in July 1954. At this time, a total of five wells had been completed. Three of these supplied the plant while two served as injection wells. Currently, there are five withdrawal and two injection wells.

From discovery date to beginning of plant operations, total production amounted to 124,000 bbl. of oil and condensate and 962 M.M.c.f. of gas. This was over a 3½-year period while over the 2½-year period in which the



The Edwards fields of Atascosa County were the forerunners of the new deep strikes to the south. Each of them produces from the upthrown block of an up-to-the-southeast fault. Fig. 1.

Oil Finders Debate Deep Edwards Chain

Part 2 of this symposium will be published next week

plant was in operation the field produced 400,000 bbl. of oil and condensate.

Reserves of the field have been calculated to be 9 million barrels of oil and condensate and 31 billion cubic feet of gas. Of these reserves, approximately 2 million barrels of oil and condensate will be recovered until cycling operations cease. After this, an estimated 23 billion cubic feet of gas with some 20 bbl. of oil and condensate per million will be recovered.

Other Edwards Fields

East Imogene field . . . East Imogene (Fig. 4) was discovered in 1948 by Humble Oil & Refining Co. The Edwards is found at an average depth of 8,100 ft. Vertical closure in the Edwards reservoir is about 150 ft. and the areal extent of the field is approximately 285 acres.

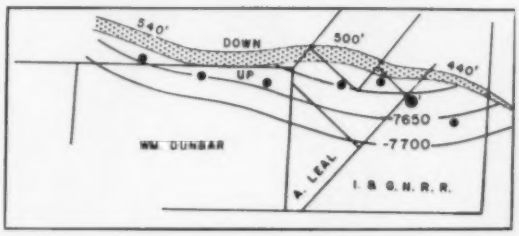
A total of seven producing wells have been drilled. Cumulative production has amounted to 37,797 bbl. of oil and 176,187 bbl. of liquid hydrocarbons.[1]

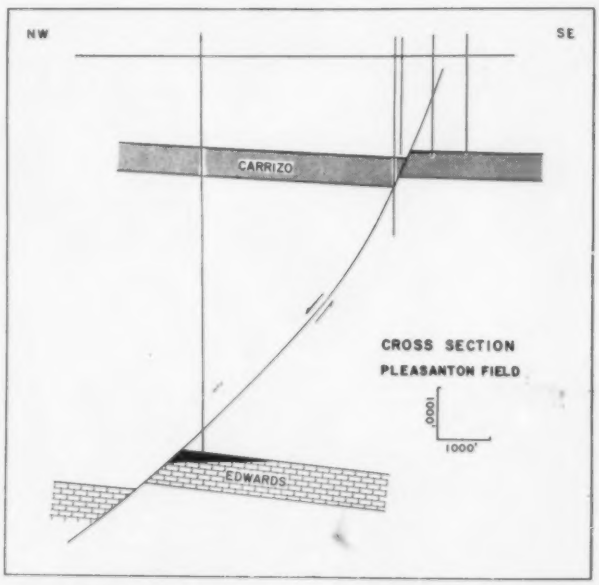
Imogene field . . . Events leading to the discovery of Imogene (Fig. 5) have been discussed in detail by Bolinger.[2] Thirty-seven wells have produced a total of 2,016,714 bbl. of oil and 45,380 bbl. of liquid hydrocarbons.[1] Areal extent of the field is approximately 1,020 acres.

Jourdanton field . . . Jourdanton (Fig. 6) is another conquest by Humble Oil & Refining Co. In 1945, the Humble 1 Henry Schorsch found the Edwards productive at a depth of 7,240 ft. Fifty-six producing wells have been drilled to the Edwards and these have produced a total of 3,837,623 bbl. of oil.[1] Areal and vertical closures approximate 4,600 acres and 350 ft. respectively. In addition to the Edwards, the Carrizo-Wilcox, Queen City, Recklaw, Sparta, and a 400-ft. sand all produce on the same fault block.

Charlotte field . . . The Edwards production at Charlotte (Fig. 7) was established in 1944 by Humble. The average depth to the Edwards is 6,900 ft. The reservoir covers approximately 471 acres and oil production from its 14 producing wells has amounted to some 1,352,252 bbl.[3]

Muil field . . . Muil (Fig. 8) has only





PLEASANTON field contoured on an electrical marker 130 ft. above top Edwards, produces from a fault block with upward displacement of more than 400 ft. (top drawing) Fig. 2, and in cross-section looks like this drawing. Fig. 3.

R. M. KNEBEL

F. C. JONES

C. E. KIMMELL

D. W. DASSOW

THE AUTHORS

ROBERT M. KNEBEL is exploration geologist for Lone Star Producing Co. at San Antonio, working the Cretaceous trend. He is a graduate of Texas A. & M. College and has had extensive experience in exploration work in East, West, and South Texas.

FRANKLIN C. JONES is geologist with Lone Star Producing Co., South Texas district, at San Antonio. He is a graduate of the University of Oklahoma and has done exploration work for Lone Star in Oklahoma City and San Antonio.

CHARLES E. KIMMELL is geologist for Bright and Schiff, San Antonio. He is a graduate of the University of Oklahoma and was formerly geologist for Amerada Petroleum Corp. Much of his work is now concentrated on the deep Edwards trend of South Texas.

DUWARD W. DASSOW is geologist for Texam Oil Corp., San Antonio. He is a graduate of the University of Kansas and was formerly employed by Amerada Petroleum Corp. He joined Texam in January 1955.

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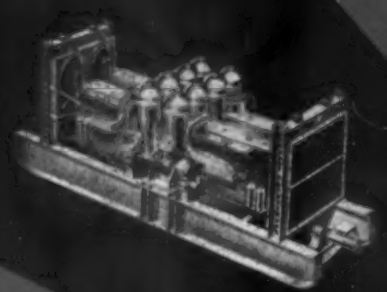

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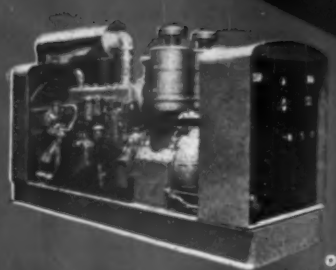

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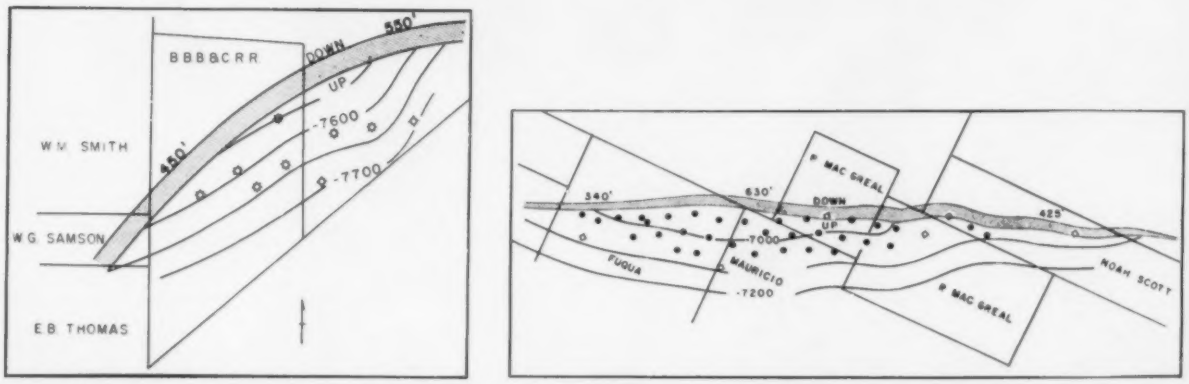
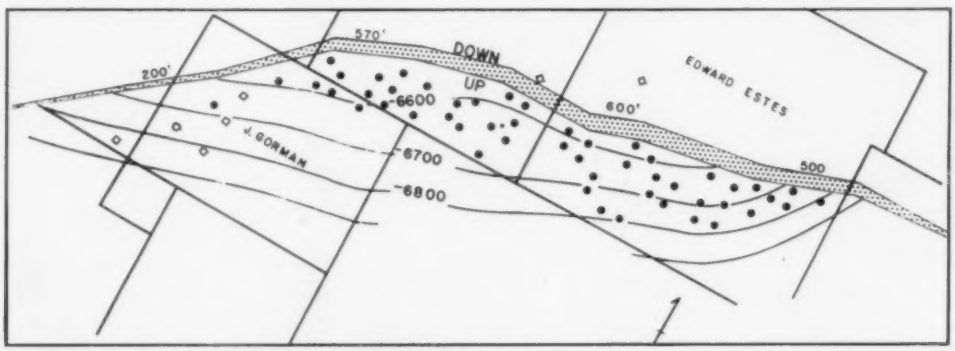
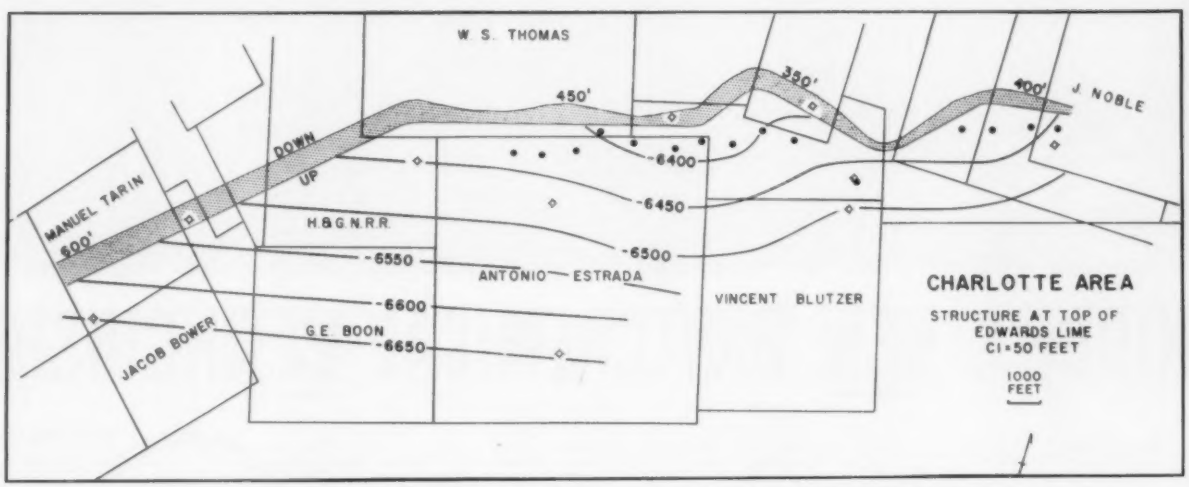


EAST IMOGENE field is an 8,100-ft. faulted Edwards gas trap with 150 ft. of closure. (left) Fig. 4 . . . while Imogene is an oil producer from Edwards at a slightly shallower depth (right). Contours are on an electrical marker 130 ft. above top Edwards. Fig. 5.



JOURDANTON field produces from the Edwards at 7,250 ft., and also from five shallower sands. Contours on an electrical marker 130 ft. above top Edwards. Fig. 6.



CHARLOTTE field is a 6,200-ft. Edwards faulted reservoir with 14 producing wells. Fig. 7.

three producing wells and probably covers little more than 270 acres. The depth to the Edwards averages 9,000 ft. Since its discovery by Quintana Petroleum Corp. in 1946, Muil has produced 131,892 bbl. of oil and 6,668 bbl. of liquid hydrocarbons.[1] Shallow sands also produce small quantities of oil on the same fault block.

Fashing (Edwards lime) field . . . This field has been discussed by the senior author.[4] Since that writing, two additional wells have been drilled, but the picture has not changed significantly.

Unnamed field between Imogene and East Imogene fields . . . Two wells have penetrated into the Edwards lime in this new field (Fig. 9). These are the Robert Mosbacher 1 Butts and the Mosbacher 1 Troell. Both apparently encountered gas and oil in the Edwards. There appears to be at least 72 ft. of vertical closure in the Edwards in this as yet undefined trap. The two wells are presently shut in awaiting a suitable market.

Acknowledgments

The authors relied on Paul R. Clevenger for aid in compiling much of the engineering data in this report.

(Continued on page 158)

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Built for a lifetime of use, the handsome new 20 and 30 pound Kidde dry chemical extinguishers have top ratings from Underwriters' Laboratories, require only 225-250 psi charging pressure. The rugged pressure gauge is recessed in handle for maximum protection. Tells at a glance if the unit is ready for use.

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References

1. Production is cumulative to January 1, 1957, and was compiled from the annual reports of the Oil and Gas Division of the Railroad Commission of Texas.
2. Bolinger, John, "History of Imogene Oil Field," Atascosa County, Texas; Geophysics, Vol. 18, No. 2, pp. 360-370, 1953.
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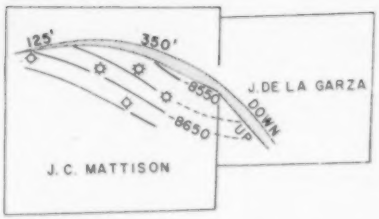
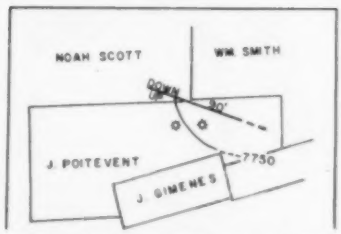
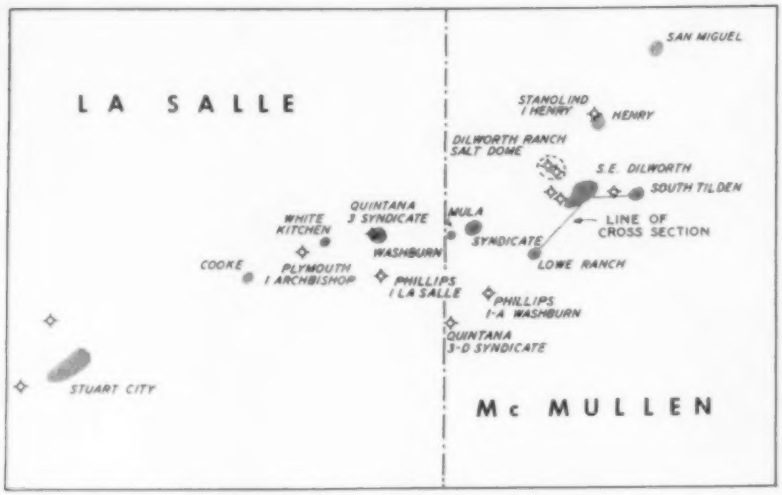


MUIL field, here contoured on top Edwards, is a small three-well producer at the 9,000-ft. level. Fig. 8.



AN UNNAMED FIELD between Imogene and East Imogene is a yet undefined trap in Edwards and has two gassers shut in for lack of market. Fig. 9.



THESE are the fields of the new deep Edwards trend in LaSalle and McMullen counties, and the important dry holes that preceded the recent strikes. Fig. 1.

Deep Edwards Strikes Point to Future Jackpots in South Texas

By C. E. Kimmell

THIS part of the symposium will cover briefly a little of the geology of the downdip Edwards limestone production in LaSalle and McMullen counties.

To get a background to this relatively new production, it might be wise to cover the Edwards exploration wells drilled prior to 1953.

In 1940 (Fig. 1), Quintana Petroleum Corp. drilled its 3 South Texas Syndicate in LaSalle County to a total depth of 11,042 ft. The well blew out at this depth; casing was run after the well was brought under control, but completion attempts failed.

In 1945, Quintana drilled the 3-D South Texas Syndicate in western McMullen County in the Green Branch area to a total depth of 15,301 ft. Three years later, Stanolind Oil & Gas Co. (now Pan American Petroleum Corp.) 1 Henry was drilled to a total depth of 14,046 ft. in northern McMullen County, penetrating into the Lower Cretaceous Hosston formation.

In 1949, Plymouth Oil Co. 1 Archbishop of San Antonio in east central LaSalle County blew out while the crew was attempting to pull some casing in preparation for abandoning. This well was drilled to 12,542 ft. and, to my knowledge, was the first to describe reef type of limestone in the Edwards.

Carrizo-Wilcox . . . In 1950, H. R. Smith 1 J. C. Dilworth drilled into salt at 7,650 ft. and was plugged back and completed as a small oil well in the Carrizo-Wilcox. The last two wells in this history were drilled by Phillips Petroleum Co.; in 1952, the 1 LaSalle Co. and later the 1-A Washburn which went to a total depth of 16,510 ft.

Since 1953, when Humble Oil & Refining Co. 1 Gubbels in northern McMullen County was completed, 10 fields producing gas from the Edwards have been found. From west to east (see Fig. 1), these are: Stuart City (discovered by Stanolind 1 Martin); Cooke (Standard 1 Cooke); White Kitchen (Lee Brothers 1 Storey); Washburn-Edwards (Standard Oil Co. of Texas 1 South Texas Syndicate); Syndicate (H. R. Smith 1 South Texas Syndicate); Lowe Ranch - Edwards (Amerada Petroleum Corp. 1 Craig); Southeast Dilworth (Standard of Texas 1 J. B. Dilworth); South Tilden (Producers Corp. of Nevada 1 Dickenson); Henry (Standard of Texas 1 Henry); and San Miguel (Humble 1 Gubbels).

My interpretation of the stratigraphy of this area does not agree entirely with other geologists' ideas for there are some rather puzzling stratigraphic problems encountered in the area.

Fig. 2 is a cross-section to no specific horizontal scale, showing the three discovery wells of the South Tilden, Southeast Dilworth, and Lowe Ranch fields. The right-hand side of this section shows what I call "reef" Edwards. I have shown the entire Edwards section to consist of this reef—this for simplicity's sake, as the only definite reef thickness known is the 1,000-ft. that was cored in the Stanolind 1 Martin in Stuart City field.

Bioclastics . . . This reef is composed of bioclastics which apparently were piled up by wave action along a belt that was a near-positive area during Edwards time. It is composed mainly of the pelecypod rudistidae; however, other pelecypods, gastropods, brachiopods and bryozoa are evident. These shells are mostly broken, crumbled pieces and have no apparent orientation. They are cemented together by a lime and/or crystalline matrix. In many of the cores that I have seen various zones will be completely recrystallized with only the faintest traces of fossil remains and have good porosities and permeabilities. It is the zones that have few or no macro-fossils that are usually impermeable. Many geologists who

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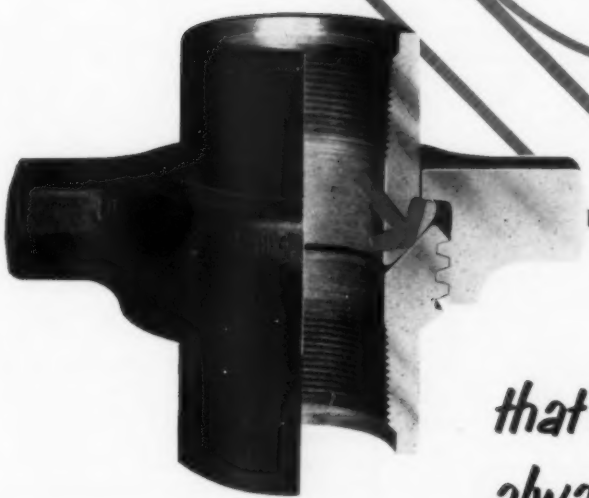

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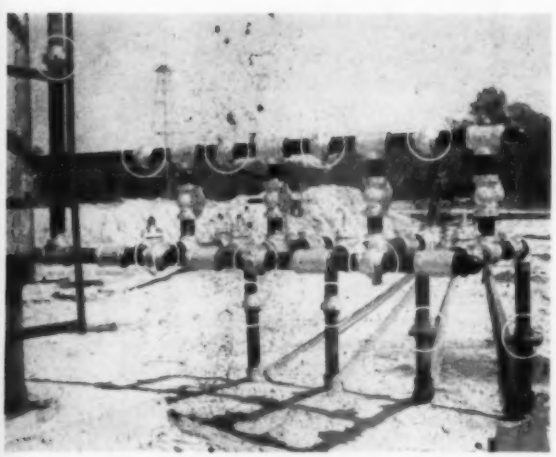

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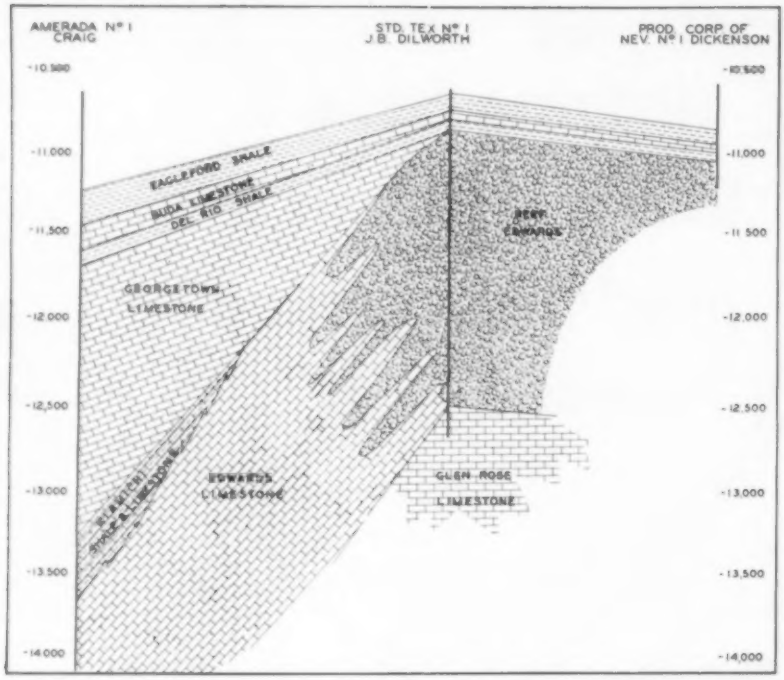
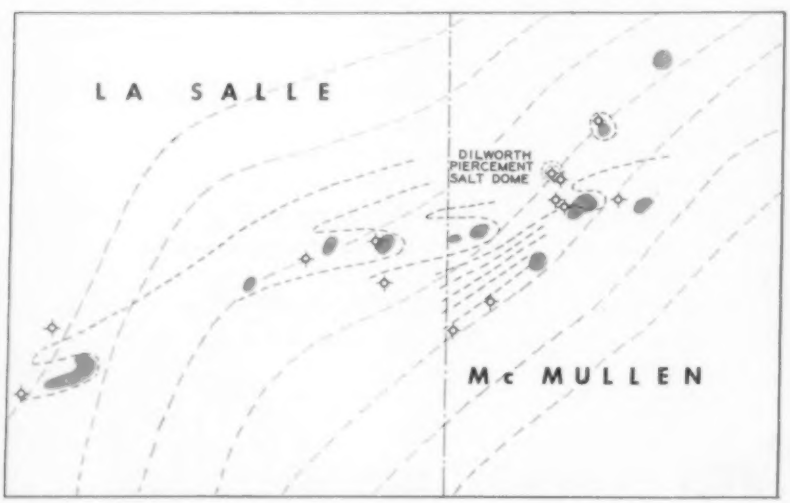


THE PRESENCE OF REEFING in the Deep Edwards has been a debatable subject, but the author's conception is shown in this cross-section through central McMullen County. Fig. 2.

have made studies of this trend think that the reef replaces the Georgetown as well as the Edwards and that the unconformity shown here does not exist or is not as large as I have shown.

Most certainly reefs are present in the Georgetown west of LaSalle County and through the Middle and Lower Cretaceous in Mexico. My reasons for calling the reef Edwards in age is that the brown-sugary dolomitic limestone typical of the updip Edwards is found in zones throughout the reef cores that I have seen.

Going downdip the section changes radically with the Amerada 1 Craig (which is downdip only 6-8 miles from these wells) exhibiting about 1,600 ft. of Georgetown plus about 400 ft. of Kiamichi shale and limestone. When you stop and consider the magnitude of this flexure (hingeline structure, fore-reef thickening) it certainly ranks as one of the largest regional features in South Texas. The Georgetown in this well is a hard, dense, brittle limestone that contains streaks of microspherulitic limestone—the typical updip Georgetown. The Kiamichi section is composed of black and dark



DIAGRAMATIC structure map on the top of the Edwards (dark contours) and on the Carrizo-Wilcox (light contours) reveals a radical departure of strike between the two formations. Fig. 3.

How They Drill to the Deep Edwards

By D. W. Dassow

This is suggested as one of the more economical methods to drill and test the Edwards in the McMullen and LaSalle County trend:

1. Drill to top of Edwards determined by sample cuttings.

2. Diamond core at least 50 ft. of Edwards and if cores warrant, open-hole drill-stem test top 50 ft. or so.

3. If drill-stem test is successful, drill 200 ft. or so into Edwards, run various logs, set pipe, and test through pipe.

If lost circulation is feared, then set protection string through Georgetown lime.

Completion practices are in the infant stage. For example, high bottom-hole temperatures (300°-400° F.) may be causing completion equipment to operate improperly.

Drill-stem-test recommendations:

1. Do not leave open-hole tester open over 1 hour.

2. Use from 4,000 to 5,000-ft. water cushion.

3. Usually need 10 ft. or so of good dense Edwards to set packer in.

Costs:

Dry hole: $100,000.

Producing well: $180,000 to $220,000.

Casing:

Surface: 1,000 to 2,000 ft.

Production string: 5½-in. N-80 on bottom 4,000 ft. and 17-lb. N-80 rest of way.

Tubing: Use tube-coat tubing (plastic coated on inside) because of corrosive tendencies of the sulfur gas in Edwards.

Logs:

Still in infant stage. Electric log is used for correlation. MicroLog has been of little use. Schlumberger has new type of logs that it thinks will be successful.

Mud type:

Diesel emulsion, 10 to 12 per cent: Low pH after 5,500 ft. or before Midway shale is encountered. Diesel emulsion is used to cut water loss and increase drilling rate. Lime-base mud used here because of absence of gypsum and anhydrite.

Mud weight, 11.1-11.5: When

brown dense limestone and brittle, black calcareous shale, and there is strong evidence that it is a facies of the Edwards as I have shown here. The Edwards in this well contains little or no evidence of macrofossils and for the most part, is a hard and dense limestone. Evidently fractures must account for the reservoir porosity in the Amerada well.

Structure map . . . Fig. 3 is a diagramatic structure map on the top of the Edwards limestone with the dark contours of about 500-ft. intervals. The light contours are on the top of the Carrizo-Wilcox.

First of all, faulting is associated with all the fields in this discussion and to my knowledge, all are down-to-the-coast normal faults with throws ranging up to 250 ft. Also, it is evident that these faults are not the controlling factor of the reservoir. This, of course, is just opposite from the updip production. One thing to notice here is the radical (for South Texas and the Gulf Coast) departure of the strike of the Edwards from that of the shallower beds that strike about N 45° E.

It is generally accepted, I believe, that structural closure is present on all production with the exception of the Amerada Craig, and with only one hole, who can tell? Disturbed conditions are apparent on the shallower beds in most of the producing areas. No doubt some of the discoveries along this trend were drilled on subsurface projection of shallower-defined structures. If they weren't, they should have been.

A general classification of Edwards fields in LaSalle and McMullen counties then, must include reef-trend fields and salt-dome fields; a questionable one is the Amerada 1 Craig (Lowe Ranch) about which little is known. In the two Edwards fields shown as salt domes, salt has not been penetrated by any wells to date, but the structures have all the earmarks of rather sharp, perhaps piercement type of salt domes. These two areas are thought to produce from crevices and fractures. A third domal field is in the testing stage between the two known fields (Standard of Texas 1 Roark). Reef type of limestone has been described in these two fields, although reportedly it was very tight.

The third salt-dome area is a piercement dome, where shallow production (but not Edwards production) has been found. This is Dilworth Ranch field, where Wilcox oil was discovered in 1950 by H. R. Smith and American Republics 1 J. C. Dilworth; this discovery well topped salt at 7,650 ft.

A gas test has been made on this feature by the Humble 2 J. C. Dilworth, which is presently drilling below 10,000 ft.

It's true that generally this deep-Edwards limestone production in LaSalle and McMullen counties is still an economic question mark and will probably continue to be until the wells are produced for a few months. But if we stop and think about the possibilities of any area that exhibits the depositional changes, the great thicknesses of Middle and Lower Cretaceous marine sediments present, the presence of reefing, the large regional flexures, the presence of salt domes and large unconformable contacts, I believe, however grudgingly, we will have to agree that the possibilities of the jackpots are very real. Certainly the discovery rate along the trend is quite enviable.

Drilling Procedure

going into Edwards. Viscosity below 9,000 ft. 65 to 70.

Acid program:

10,000 gal. of wash acid with 500 to 1,000 gal. of mud acid and some surface-tension reducing agent. 4,200 lb. will break down formation.

Reservoir:

Porosity around 10 per cent. Permeability varies from 0.1 md. to several hundred. Realistic recovery per acre-foot: 800,000 cu. ft. gas. Condensate: 10 to 20 bbl. per million cubic feet of gas.

Price:

Gas contracts have been made for 14 cents.

Next Week

Part 2

This Deep Edwards symposium will cover the geophysical techniques being employed in the search for these traps. Authored by W. Lee Moore of Petty Geophysical Engineering Co., Part 2 is a concise revelation of how geophysics and geology are working together in the important new campaign.

EXPLORATION HIGHLIGHTS

APPALACHIAN

OHIO

Roseville Pool Revived By Extension Oil Well

Roseville pool, inactice for some time, was extended ⅓ mile northeast by the Mid-East Oil Co. at its 1 (2) C. A. Orwig, Section 34, Newton Township, Muskingum County. Clinton sand was found at 3,580-3,654 ft. Daily oil production tested 3 bbl., natural, and 50 bbl. after fracturing. Gas volume was 500,000 cu. ft. per day.

Production in the Kokosing River Valley was extended farther west by C. A. Davis and others 3 M.W.C. District, Lot 3, Butler Township, Knox County. Clinton at 2,795-2,849 ft. made 5 bbl. of oil, natural, and 70 bbl. in a 24-hour test after fracturing.

The second well south of Bethlehem pool confirms an extension. W. H. Patten and others 2 W. H. Patten, 2nd. Qr., Bethlehem Township, Coshocton County, logged the Clinton at 3,615-3,638 ft. and gaged 250,000 cu. ft. gas and 80 bbl. of oil in 24 hours after fracturing.

Brinkhaven Stepout Well Makes 200-Bbl. Producer

A stepout east of Brinkhaven pool resulted in a 200-bbl. well in 24 hours after fracturing. It is the 1 Seymour Davenport, Section 16, Richland Township, Holmes Countly. Mid-East Oil, the operator, reported Clinton at 3,185-3,239 ft. with 10 bbl. of oil natural, per day.

A west offset to the Marne pool, Waverly Oil Works 1 N. J. Rubeck, Lot 2, Madison Township, Licking County, logged Clinton at 2,591-2,621 ft. with a 10-bbl. showing, natural, and

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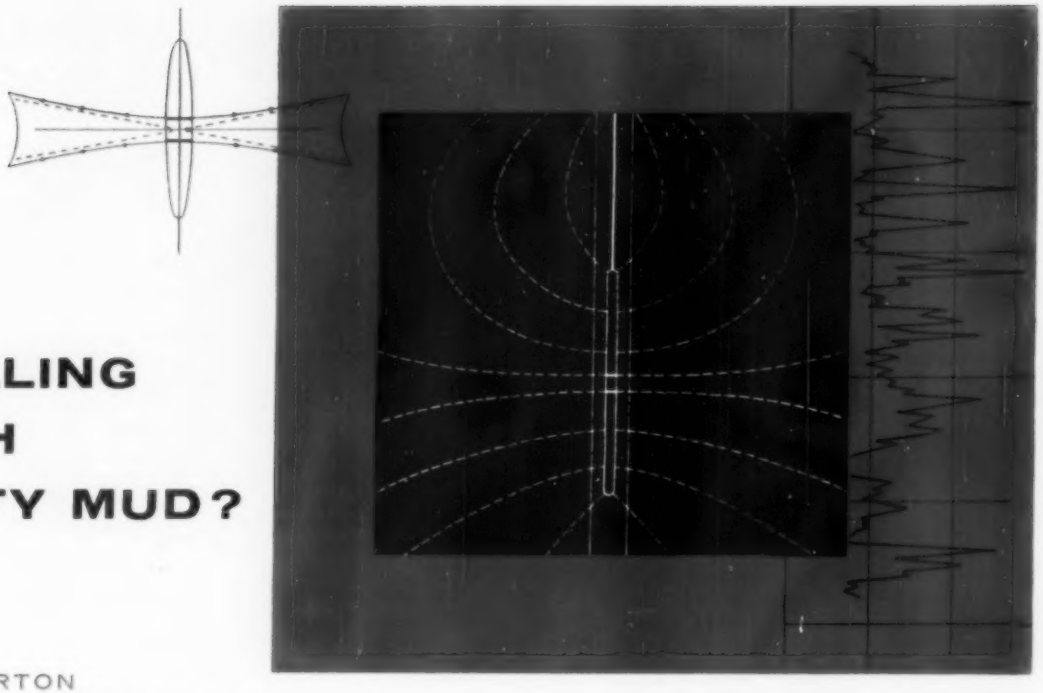

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- Guard Log – a resistivity log that helps determine lithology and water saturation.

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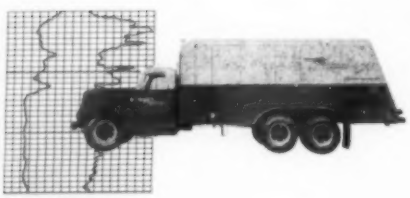

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New Mexico Case History...

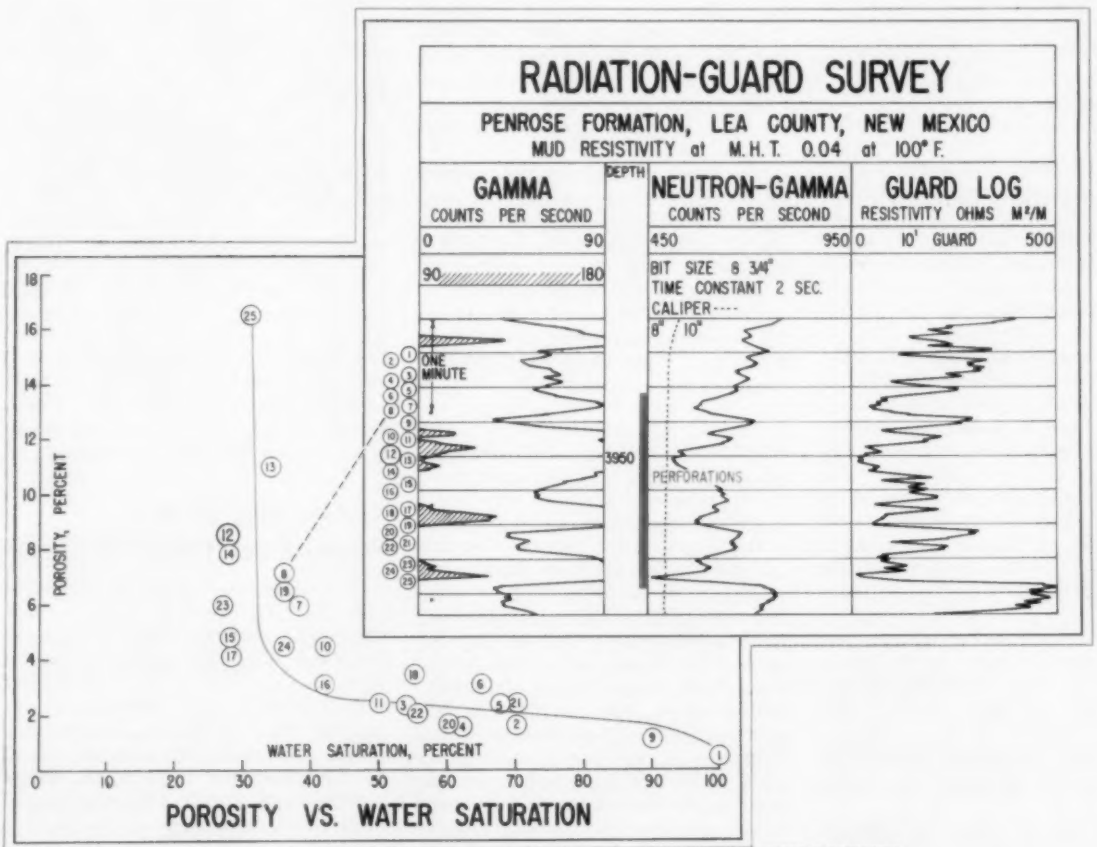
HARDROCK PENROSE FORMATION DRILLED WITH SALTY MUD, SUCCESSFULLY EVALUATED WITH RADIATION-GUARD TECHNIQUE

The Penrose formation of Lea County, New Mexico, is dominately sand and dolomite. Correlation with whole core analysis has shown that despite high gamma activity... the neutron-porosity relationships obtained in test wells of limestone are applicable. When this formation is drilled and surveyed with saline muds, the interpretation techniques developed for the Radiation-Guard Log provide accurate evaluation and a reliable completion guide.

Well was logged by Halliburton. Radiation-Guard technique was used. Analysis of the log curves yielded points on the graphs. These in turn suggested a constant capillary pressure curve indicating that:

1. The entire section is remote from an oil-water contact and no water production would be anticipated.
2. Only that part of the section having a porosity above 3% will contribute materially to oil production.
3. There is a 27' section with a porosity above 3%. Average porosity of this section is 7%, average water saturation 33%.

Well was perforated from 3932' to 3987'. Produced 50 BOPD with no water on a 12/64" choke.



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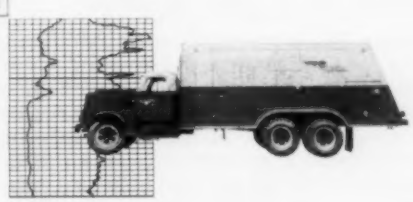


400 bbl. in 24 hours after fracturing.

A third gasser in the north central part of Knox Township, Holmes County, Ohio Fuel Oil Co. 1 C. A. Peterson, Section 23, gaged 2,860,000 cu. ft. per day after fracturing. Clinton sand at 3,196-3,209 ft. made 350,000 cu. ft. per day, natural.

ARKANSAS

Delayed Well Completion Confirms Tokio Discovery

Completion of the second well for Northwest Stamps field, in Lafayette County, is reported by Slade Oil & Gas Corp. The well was drilled last January but has been standing uncompleted since then because of wet and boggy conditions in the area.

The well, 1-B Shewmake Estate, pumping 69 bbl. of 15°-gravity oil (net) per day with 10 per cent basic sediment and water, is the south offset to the discovery well, and confirms the Tokio production in that well. Tokio pay is perforated at 2,292-96 ft.

Spot location is in 32-15s-23w.

CALIFORNIA

West Bellevue Discovery Spurs Extension Drilling

Two extensions are being started in West Bellevue field, 10 miles west of Bakersfield, as a result of recent good producers completed in the new Stevens sand pool.

Verde Enterprises is rigging up 42-A Mariposa-Kliewer, a northeast offset to its 33 Wesco-Clark in 33-29s-26e. The latter was completed flowing 300 bbl. daily of 34°-gravity crude from 7,700-30 ft.

Hancock Oil Co. is preparing to start 64 Easton, two locations east of the discovery. It recently completed 53 Easton at 7,688-98 ft. for an initial rate of 25 bbl. hourly through a 20/64-in. choke.

Superior Oil Co. scored the new field discovery last February. Its 44 Wesco-Clark, in Section 33 initially flowed 98 bbl. daily through a ⅛-in. choke. Three months later it was averaging 150 bbl. daily, producing from 22 ft. of sand above 7,720 ft.

Ventura Gets New Wildcat

Cabeen Exploration Corp. is rigging up for a 6,500-ft. wildcat 1½ miles north of Camarillo in Ventura County. In 24-2n-21w, the test is about 1 mile west of Humble Oil & Refining Co. D-2 Berylwood Investment Co., abandoned at 9,900 ft. in 1955.

Fishing Delays Deep Test

A fishing job is delaying testing at Humble Oil & Refining Co.'s 15,000-ft. wildcat in the Rumsey Hill area of Yolo County, Sacramento Valley. The wildcat, 1 M. A. Tippetts estate, located in 15-12n-3w, 13 miles northwest of nearest gas production, at a depth of 15,000 ft. is the second deepest test drilled in Sacramento Valley. Prior to the fishing job, Humble was preparing to run casing.

CANADA

ALBERTA

Elkton-Harmatton Area Gets Mississippian Oil

Shell Oil Co., Ltd., and Canadian Superior Oil of California, Ltd., have discovered oil in the Mississippian formation at a well in the general Elkton-Harmattan area of southwestern Alberta. Information received indicated that three consecutive drill-stem tests were run. Each flowed oil and gas to surface. At last report, core-hole was being reamed preparatory to a further test 82 ft. below the discovery horizon's contact point.

The new oil strike for this already prolific Mississippian oil producing area, the Shell-Canadian Superior-Elkton C7-24 test, was drilled on LSD 7, 24-32-4w5. It is 4 miles east of oil production in the northern sector of the Harmattan-Elkton oil field and lies 2½ miles west-southwest of the Great Plains et al, Eagle Hills No. 7-29 Mississippian gas discovery well.

Delayed Testing Supports Virginia Hills Discovery

Alberta's significant oil discovery well in the Virginia Hills area of West-Central Alberta has given up encouraging crude recoveries during initial production tests. The well, Home-Union-H.B.-Virginia Hills 9-20, LSD 9, 20-65-13w5, assured its backers of success in the Slave Point sector of the Middle Devonian earlier this year, but because of its location, 115 miles northwest of Edmonton, it was not possible to test prior to the spring break-up, and the operator was forced to suspend operations. A recent road-building program enabled the firm to move back into the site.

In its initial test, over a 444-ft. perforated interval in the Slave Point, and after acid treatment, the well flowed oil at an initial rate of 1,200 bbl. per day. Further tests have been run and will continue to be run until storage facilities have been filled. The latter tests, run through chokes varying in sizes from ⅜-in. to ¼-in., averaged 816 bbl. per day over a 3-day period.

Virginia Hills No. 9-20 was drilled by Home and its partners, United Oils, Ltd., Alminex, Ltd., and Geoil, Ltd., on Petroleum and Natural Gas Reservation No. 2146. This spread of 92,160 acres, contained in Townships 65 and 66, Ranges 12 and 13w5, was acquired from the team of Union Oil Co. of California and Hudson's Bay Oil & Gas, Ltd. Under terms of the agreement, the Home group undertook to drill a pair of tests within the Reservation to earn a one-third interest. The initial hole was recorded as the discovery while the second, Virginia Hills No. 16-12, on LSD 16, 12-66-13w5, 5½ miles northeast of it, was found nonproductive. No further drilling has been announced as yet for this area.

Wood River Discovery Placed on Production

Canadian Export Gas, Ltd., and Cree Oil of Canada, Ltd., partners in a D3 oil discovery in the Wood River area of central Alberta, 13 miles east of Ponoka and 18 miles south-southwest of Wetaskiwin, have completed production test operations and have placed it on steady production. The discovery well, Wood River No. 6-16, on LSD 6, 16-43-23w4, encountered a 30-ft. pay sector in the D3 formation. In 5 days of testing it produced its allowable of 250 bbl. per day through a 5-ft. perforated interval. Initial test averaged 9.67 bbl. of oil hourly. The Conservation Board in Alberta has set an allowable of 115 bbl. per day and the well now is producing at that rate. There has been no evidence of formation water during the initial production.

Saddle Hills Wildcat Proves Gas Productive

A gas discovery in the Saddle Hills area of northwestern Alberta was chalked up last week at a Pan American Corp. hole. The well, East Saddle Hills A-1, on LSD 11, 33-75-7w6, flowed at rates up to 5,000,000 cu. ft. per day. Pay is in the Caddote formation. Location is 250 miles northwest of Edmonton and is 2 miles north-northwest of the Fina-Royalite-Saddle Hills No. 3 Gething gasser.

Discovery zone was topped at the 3,605-ft. level. Two consecutive drill-stem tests, covering 45 ft. of zone, flowed at the 5,000,000-ft. per day, and 4,000,000-ft. per day rates, respectively. Last test indicated that the zone had been penetrated as 210 ft. of salt water was recovered from the drill pipe.

TEXAS

WEST CENTRAL TEXAS

Nolan County Gains Big Gardner Discovery

Jocelyn-Varn Oil Co., Abilene, has completed its 1 J. M. Craig as a lower Gardner discovery, flowing 624 bbl. of oil a day. Gravity was 41.7°, and gas-oil ratio was 400:1. Production was through 32/64-in. choke, from perforations at 5,494-98 and 5,480-88 ft., under tubing pressure of 200 psi.

Operators drilled to 5,968 ft., then plugged back to 5,550 ft. Top of pay was placed at 5,440 ft.

Location is in Section 32, Block 1-A, H&TC Survey. It is 3 miles northeast of Blackwell and ½ mile west of production.

Ellenburger opener . . . Robert L. Wood and Associates, Midland, have opened Ellenburger production 6 miles south of Roscoe at 1 T. D. Young, 82-23-T&P Survey. Completion potential was 203 bbl. of oil a day through 18/64-in. choke, from pay at 7,021-40 ft. Gas-oil ratio was 870:1.

Location is 2 miles southwest of South Roscoe (Strawn) field .

New Fisher County try . . . An Ellenburger wildcat for central Fisher County has been announced by E. F. White, Jr., Corp., Dallas. The test will be 1 Victor B. Murphee, in the J. Chumbley Survey 312. Drillsite is 2 miles northwest of North Roby field, 3 miles southeast of Rotan and ¼ mile southeast of a 6,800-ft. Ellenburger failure.

Parker County . . . Advance Petroleum Corp. 1 Jake L. Long, central Parker County wildcat, has indicated discovery gas production from the Atoka conglomerate.

LOUISIANA

NORTH LOUISIANA

Second Smackover Well Testing at Bull Creek

Carter Oil Co. is confirming its recent discovery of Smackover gas-condensate production at Bull Creek field, Union Parish. Its 1 Hicks-Cook and others, SE SE NW 21-21n-3w, confirmation test, averaged 3 bbl. of condensate per hour during a 10-hour gage through 7/32-in. choke. During that gage, its gas-condensate ratio was 11,000 cu. ft. per bbl. Flowing pressure was 1,200 psi.

The Smackover pay is perforated at 10,612-25 ft. Bottom of the hole is 11,080 ft.

The well, about 2 miles southwest of Bernice, is a little more than a mile east of Carter's discovery well. That well, 1 Mitcham et al, in 20-21n-3w, has open hole in the Smackover at 10,344-10,423 ft. It flowed 132 bbl. of 61°-gravity condensate and 2,663,000 cu. ft. of gas per day on completion gage through ¼-in. choke.

SOUTH LOUISIANA

Deep Pays Spread Around Loke Barre's West Flank

Deep production at Lake Barre field, in Terrebonne Parish, is being extended a mile around the west flank of the dome..

Extension is by The Texas Co. at its 1 Unit 26 well, on a state and Louisiana Land & Exploration Co. unit in Lake Barre. It is rated good for 194 bbl. of 21.7°-gravity oil per day, restricted flow.

The well was drilled to 14,798 ft., and is producing from the bottom sand, perforated at 14,748-97 ft.

Oil production was with gas-oil ratio of 7,129 cu. ft. per bbl. under pressure of 4,900 psi.

Two St. Charles Wildcats Indicate Gas Production

Discovery of two more gas-productive areas in St. Charles Parish was indicated last week.

One discovery was by California Co. at its 1 Arthur Croft, in 40-12s-9e, west of Kenner, on the north side of the Mississippi River, about 15 miles west of New Orleans.

The other, about 6 miles south, was by Anderson-Prichard Oil Corp. and Union Oil Co. of California at their 1 Brady, in 31-13s-22e. It is about 3½ miles west of Avondale field, about the same distance southwest of New Orleans.

California Co.'s well, testing perforated pay at 10,192-10,202 ft., flowed dry gas at the rate of 6,000,000 cu. ft. per day. Pressure was 3,400 psi. Hole had been drilled to 11,303 ft.

The Anderson-Prichard and Union well produced at the rate of 108.30 bbl. of 49.8°-gravity condensate and 5,700,000 cu. ft. per day from perforations at 10,024-28 ft. Its pressure gaged 3,100 psi.

New Discovery Extends Humphreys Production

Shell Oil Co. has another deep gas-condensate discovery in the Humphreys area, about 10 miles west of Houma, in Terrebonne Parish.

It is about 2 miles southwest of Shell's discovery well at Humphreys, and about a mile east of another gas-condensate discovery-well drilled by C. G. Glasscock and Tidelands Oil Co. The area is about midway between Orange Grove field, about 3 miles southeast, and Gibson field, on the northwest.

Shell's new well, 3-A Continental Land & Fur, is productive from perforated interval at 12,042-68 ft. in hole drilled to 12,626 ft. Tested through 9/64-in. choke, it flowed 51.81 bbl. of 46.9°-gravity condensate with 3,480,000 cu. ft. of gas per day. Flowing pressure is 8,950 psi.

Humphreys area's discovery well, completed a year ago, is productive from pay at 12,526-40 ft. Its northwest offset, completed last March, opened a shallower pay, perforated at 10,621-26 ft. The Glasscock-Tidelands discovery well was completed last January with pay at 10,718-22 ft. Shell's second test in the Humphreys area was a dry hole at 13,386 ft.

LOUISIANA OFFSHORE

Eugene Island 175 Field Gets Third Oil Producer

Sinclair Oil & Gas Co., operating for a group including Sohio Petroleum Co., Peoples Production Co., and El Paso Natural Gas Co., has completed the third good producer in Eugene Island Block 175 field, 40 miles off shore in the Gulf of Mexico from St. Mary Parish.

The new well, 5-A, drilled from the same self-contained platform as the previous two wells, flowed 498 bbl. of 30.1°-gravity oil per day through a 5/32-in. choke from Miocene sand perforations at 11,878-88 ft. Flow was with gas-oil ratio of 727 cu. ft. per barrel. The platform is in 87 ft. of water.

The pay is the same as that in which the field's discovery well (1-A) was completed in June 1956. The second well (4-A), completed last March, produces from another Miocene sand, perforated at 11,780-94 ft.

MICHIGAN

Acid Treatment Boosts Oil Flow at South Billings

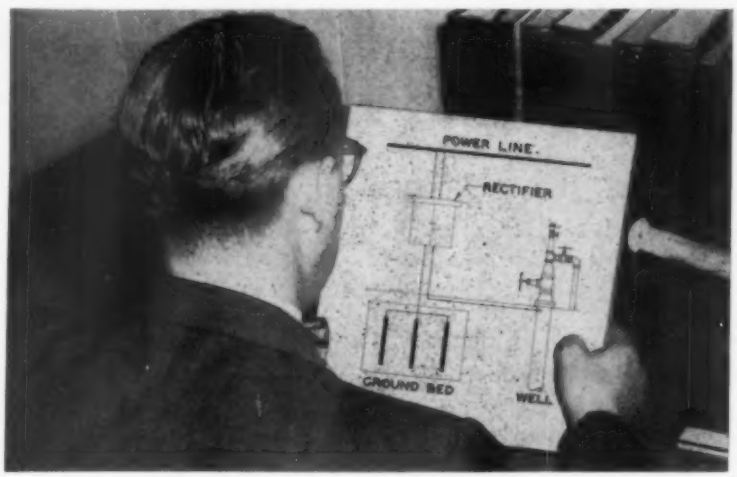
Acid treatment in Dundee oil pay zone resulted in almost sensational results in the new South Billings pool, Billings Township, Gladwin County. New well, the diagonal southeast offset to the South Billings pool discovery, was boosted from only a few gallons of free oil showing natural to a restricted flow of 60 bbl. of oil in 8

hours on the third day following acid treatment.

This exceptional acid treatment result was at Socony-Mobil Oil Co., Inc. D-1 State Billings, NE NW NE 13-17n-1e. Dundee top was checked in at 3,462 ft., approximately 8 ft. lower than objective top at the discovery producer. Pay zone was drilled between 3,541-46 ft. Hole was bottomed out at 3,570 ft. and carried 80 gal. of free oil natural in 29 hours, 33 gal. of oil in 12 hours, before 5-in. casing was cemented in 3,529 ft. After hole was cleaned out following casing program, well carried only 5 gal. of free oil. Pay was acidized with 4,000 gal.

In the first 14 hours after acid, the well flowed back 200 bbl. of fluid, of which 53 bbl. was oil. In the next 8 hours it flowed 85 bbl. of oil and 14 bbl. of water (probably acid water) followed by the 60-bbl. flow in 8 hours through a restricted choke. Bulk of the acreage in the South Billings pool area is controlled by Muskegon Development Co., driller of the discovery well, and Socony Mobil.

East 40-acre offset was staked to potential new Dundee discovery in Crystal Township, Oceana County, by George S. Swan and W. L. (Bill) Harvey for the 1 Hansen, SW NW NW 14-16n-16w. Meanwhile the 1 Skidmore Land Co., SW NE NE 15-16n-16w, the discovery well, continued to flow an average of 40 bbl. of oil a day, plus water, through 20/64-in. choke from perforated Dundee pay. A total of 18 perforations was shot between 2,508-14 ft. Pay was acidized.



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NEW MEXICO

SOUTHEAST NEW MEXICO

Lea County Prospect Continuing Flow Tests

Humble Oil & Refining Co. 1 State "AU," Permo-Pennsylvanian discovery 9 miles northeast of Maljamar in Lea County, was testing on perforations at 11,096-11,144 ft. A 12-hour gage produced 285 bbl. of new oil plus 10 bbl. of sediment and water, through ¼-in. choke. Tubing pressure was 500 psi.

Humble's test was drilled to 13,375 ft., then plugged back to 11,870 ft. Location is in 4-16s-33e, 1 mile southwest of Humble 1 "AQ" State, recently completed Pennsylvanian discovery.

Humble has set casing at 10,456 ft. for completion attempt at its 5 South Four Lakes Unit, in 2-12s-34e, northern Lea County. Production was indicated on a drill-stem test at 10,358-41 ft. when it flowed 13 bbl. of oil an hour.

Production at South Four Lakes field is from the Wolfcamp, Pennsylvanian and Devonian.

Phillips Petroleum Co. has completed its 1 Austin as a Mississippian gas discovery, after many weeks of testing. Location is south of Tatum in 17-14s-36e.

Calculated daily potential was 10,300,000 cu. of gas, plus an unestimated amount of condensate. Production was from perforations at intervals between 13,194-13,286 ft.

OKLAHOMA

New Simpson Production Opened in Grant County

Caulkins Oil Co. currently is completing a Simpson discovery in Grant County. On drill-stem test, the 1 Phillips SW SE SW 33-26n-3w, flowed oil at the rate of 75 bbl. per hour from the Simpson section 5,170-5,218 ft. The well is in East Lamont field, a Mississippian pool discovered by Caulkins in November 1956.

The Lamont-Deer Creek area has been of prime interest to exploration men since the discovery of Southeast Lamont field in 1937 by Carter Oil Co. The latter area is only 3½ miles south of the new Simpson discovery.

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Simpson wells at Southeast Lamont have produced in excess of 10,000 bbl. per acre. Most Simpson fields in the general Grant County area are small, sharply folded anticlines, with the Simpson production confined to the crest and covering only 80-160 acres. Invariably, other pay zones above the Simpson are productive, making these "microstructures" a very attractive target.

In addition to the Simpson zone, the Caulkins well has indicated production from the Layton sand at 3,818-28 ft.

McClain County Wildcat Indicates New Hart Pool

Frank G. Weimer and John R. Fitzhugh are drilling ahead after establishing Hart production with a prolific drill-stem test. The Tulsans' 1 Fry, SE SW 19-5n-2w, tested the Hart, which flowed oil at an estimated 20 bbl. of oil per hour from interval at 7,232-83 ft. The wildcat is only 1 mile east of the French pool, in McClain County.

Sinclair Oil & Gas Co. completed a Simpson discovery 1½ miles northwest of the new discovery in 1947, but never drilled a confirmation test to its discovery.

McClain County is the scene of an active drilling campaign aimed at exploring and exploiting prolific Simpson production. Production appears to be related to faulting and local closures are mapped quite accurately by geophysical work.

Show of Oil for Okfuskee's Gilcrease

Olin Oil & Gas Corp., 1 Palmer wildcat in the South Castle area of Okfuskee County, is SW NE NE Section 27-12n-9e, has logged a show of oil in the lower Gilcrease sand at 3,059-81 ft. An open hole drill-stem test from 3,067-83 ft. flowed gas to surface in 7 minutes and recovered 1,700 ft. of 32°-gravity oil, 150 ft. of muddy oil plus 50 ft. of heavily oil-cut mud. The initial flow pressure was 40 psi., final flow pressure was 500 psi. and bottom-hole shut-in pressure was 1,245 psi. in 20 minutes. The well is now drilling below 3,350 ft.

Three-quarters of a mile north, Olin has completed their third well in the East Castle pool, the 1 Replogle, SW SE NE Section 22-12n-9e. The well was completed through perforations at 3,780-3,800 ft. in the Misener-Hunton section flowing at the rate of 56 bbl. of oil per hour on a 32/64-in. choke with flowing tubing pressure of 600 psi. A drill-stem test of the lower Gilcrease sand, at 3,125-36 ft. flowed an unestimated amount of gas to the surface in 9 minutes and recovered 1,500 ft. of oil and 60 ft. of oil-cut mud. The initial flow pressure was 55 psi., the final flow pressure was 350 psi. and the bottom-hole shut-in pressure was 1,260 psi. in 20 minutes.

TEXAS

EAST TEXAS

Harrison County Gains Prospect, Deep Tests

Harrison County had a Pettet limestone prospect 4½ miles west and slightly north of Marshall, and locations for two 7,000-ft. Pettet wildcats in last week's developments.

Hollandsworth Oil Co. 1 R. E. Brown, S. Wagley Survey, withheld details on a drill-stem test in the Pettet limestone, but operators had run casing to 7,274 ft., total depth, for production tests. Perforations and acid treatment at 7,121-26 ft. produced acid water with a light trace of oil. Location is approximately 2 miles south of Northeast Hallsville Pettet field.

Barnwell Production Co., Shreveport, has staked location for a Pettet wildcat, nearly 5 miles north of Hallsville townsite, in northern Harrison County. The project will be 1 Homer L. Deakins, in the L. H. Mabbitt Survey. Nearest production to the test is in North Lansing field, which has production from the Rodessa and Travis Peak.

Another test for the area around Hallsville is R. E. Smith and Bill R. Tipton 1 Jim Brightman. Location is on a 31-acre tract in J. W. Overstreet Survey, 1½ miles northwest of Northeast Hallsville field. Contract depth is 7,000 ft., to test the Pettet.

Freestone County Wildcat Under Way

Drilling had started at northwestern Freestone County's 8,000-ft. Travis Peak wildcat, being put down by Four W Oil Co., Corsicana. Travis Ward Drilling Co., Cayuga, has contract.

The well is 1 Fay Burleson Sneed, located on a 100-acre tract in Wiley Carter Survey, A-115, 3 miles southeast of Streetman townsite.

The nearest deep tests in the area to furnish subsurface control are in the Kirvin field, 4½ miles to the southwest. Production at Kirvin is from the Rodessa and Pettet formations. Humble Oil & Refining Co. drilled its 1 B. C. Whatley in this area, in 1948, but abandoned the hole at 7,318 ft., in the Pettet.

The Texas Co. has announced location for a wildcat to test the Woodbine in southeastern Freestone County. The operation is 1 A. F. Settlemyre, located on a 160-acre tract in R. H. Heatley Survey, A-311.

No. 1 Settlemyre is 3 miles northwest of Keechi townsite, and on the flank of Oakwood salt dome.

Nearest hole to furnish control on the Woodbine was drilled by William D. McBee as the 1 A. F. Settlemyre. Total depth was 6,350 ft., in the top of the Woodbine.

Wood County . . . F. R. Jackson and B. A. Holman are scheduled to move in for a Woodbine wildcat 7 miles east-northeast of Quitman in eastern Wood County. The test will be 1 Mary Harris Keys, located on a 369-acre lease in the northern portion of Jane Duncan Survey, A-140. Contract depth is 7,600 ft.

New pay discovery . . . Delta Drilling Co. has filed for a Kirkland sand discovery at its 2 J. P. Kirkland, dual producer in the Quitman field, central Wood County.

The new pay zone was perforated from 8,359-67 and 8,369-81 ft. Initial production was 140 bbl. of 63.5°-gravity oil a day through 12/64-in. choke. Flowing casing pressure was 2,660 psi., and gas-oil ratio was 9,320:1. Nearest comparable production is 8 miles northeast in Coke field. A pinchout is said to separate the two fields.

Potential in one of Quitman field's regular pays was taken earlier at 2 Kirkland. Rodessa perforations at 8,409-41 ft. flowed 565 bbl. of 44°-gravity oil a day through ¼-in. choke. Flowing tubing pressure was 1,200 psi., and gas-oil ratio was 864:1.

SOUTHWEST TEXAS

New Escondido Reservoir Produces in Galba Area

Texam Oil Corp. reports the discovery of another Escondido (Navarro) oil reservoir in Atascosa County.

The discovery is in its 1 Harding, about a mile southeast and across a fault from the company's production in Galba field. The discovery well is rated at 76 bbl. of 39°-gravity oil per day, flowing through 1.8-in. choke.

McMullen Wildcat Finds Shallow Gas Production

Discovery of a shallow gas area southwest of Hays-Ezzell and Claunch gas areas, in eastern McMullen County, has been made by Texas Seaboard Oil Co. at its 1-B Wheeler, in the Neill McLain Survey. Location is 2½ miles southwest of Calliham.

The shallow pay is perforated at 939-43 ft. Calculated open-flow potential is 3,650,000 cu. ft. of dry gas per day. Shut-in pressure is 469 psi. The hole was drilled to 1,515 ft.

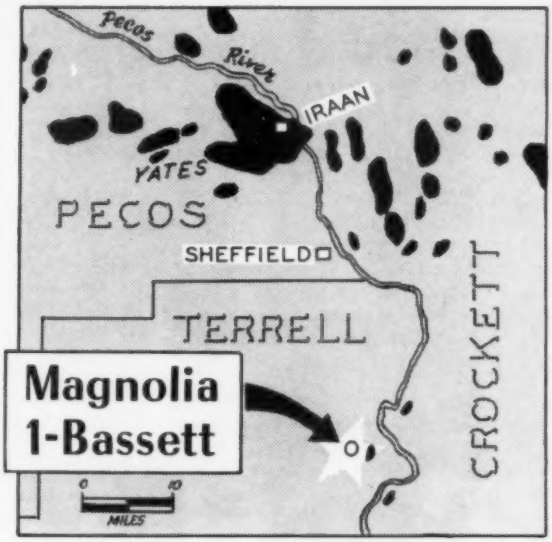
Wild Gasser in West Texas Blows From Devonian

Terrell County's new gas, or gas-distillate discovery, was the center of interest for West Texas operators. Last week the well blew out from the Devonian, caught fire and destroyed the derrick, but was brought under control and capped.

The discovery is Magnolia Petroleum Co. and Western Natural Gas Co. 1 Brown & Bassett, Section 218, Block Y, TCRR Survey. Location is 25 miles south of Sheffield. Geological position is on the eastern edge of Sheffield channel.

No. 1 Brown & Bassett was being drilled with a Magnolia rig. Projected depth was 15,000 ft. to test the Ellenburger. First gas shows were at 12,400 ft., identified as the top of the Devonian. At 12,407 ft. pressures had increased to such an extent that blowout preventers were closed. According to early information, failure occurred below the blowout preventers and the well flowed gas out of control.

Estimates on the flow of gas were as high as 75,000,000 cu. ft. Smoke with the gas fire indicated presence of some distillate.



Magnolia Petroleum Co. 1 Bassett in northeastern Terrell County blew out while testing the Devonian, burned, but was brought under control.

No. 1 Brown & Bassett is a rank wildcat and is looked upon as a significant discovery. Magnolia and Western Natural jointly hold over 38,000 acres in the area. The only nearby production is a marginal gas area originally called Goode field, which had gas in the Permian and Pennsylvanian at depths from 5,200-5,600 ft.

El Paso Natural Gas Co. has filed application to drill a 7,500-ft. wildcat in Terrell County. Location in Section 74, Block 2, I&GN is about 4 miles southeast of the Brown & Bassett discovery. El Paso's test will be 1 Chandler. The company holds 7,569 acres around the well.

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WEST TEXAS

Azalea Field Gains Devonian Extension

The Azalea (Strawn gas-distillate and Devonian oil) field in northeastern Midland County gained its second Devonian well at Murphy H. Baxter 1-18 Crespi. Location in 18-38-T2S-T&P, is a 1-mile north extension.

Initial potential at 1-18 Crespi was 582.5 bbl. of 46°-gravity oil a day, through 15/64-in. choke, from perforations in the Devonian at 11,467-11,625 ft. Top of pay was placed at 11,448 ft.

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The field discovery had Devonian pay at 11,400-11,520 ft., plus Strawn gas and distillate.

TEXAS PANHANDLE

Ochiltree Discovery Completed from Dual Zones

Sinclair Oil & Gas Co. has completed its 1 A. J. George, northwestern Ochiltree County, as a dual oil and gas discovery. Location is 1 mile north of Perryton townsite, in NE NE Section 18, Block 11, W. Ahrenbeck Survey.

Oil potential was 73 bbl. a day on the pump, from an Atoka section at 7,680-90 ft. Gravity was 39° and gas-oil ratio was 1,150:1.

Perforations in the Morrow at 7,983-94 ft. flowed gas at the rate of 4,640 M.c.f., plus 18 bbl. of 53°-gravity condensate. Flowing pressures were not reported.

Pan American Petroleum Corp. has made location for 1 Betty Gas Unit, projected 7,900-ft. exploration in Section 100, Block 11, W. Ahrenbeck Brothers Survey. Location is 21 miles northwest of Perryton townsite in Ochiltree County, and a 1-mile northeast stepout to Sharples Oil Corp. 1 Thompson, Morrow gas discovery.

Hansford County Well Is Dual Gas Discovery

Horizon Oil & Gas Co. 1 Earl E. Novak "127," in southeastern Hansford County, was assured of gas production from two zones. Perforations in the Keys formation flowed 350,000 cu. ft. of gas a day before fracture treatment, and 2,500,000 cu. ft. a day following treatment. The latter gage was through ½-in. choke.

The Cleveland zone was then tested, around 8,300 ft., and flowed at the rate of 3,300,000 cu. ft. of gas a day through ½-in. choke.

Location is in Section 127, Block 4-T, 4 miles south of Spearman. It is 3 miles northwest of the same operator's 1 Buzzard, an upper Morrow discovery.

Central Ochiltree County Strike Completed

Phillips Petroleum Co. has reported completion gages at its 1 Pshigoda, located 3 miles south of Ochiltree townsite and 8½ miles east of Farnsworth field, in Section 572, Block 43, H&TC Survey.

Potential from the Douglas sand at 5,711-31 ft. was 798 bbl. of 43°-gravity oil a day.

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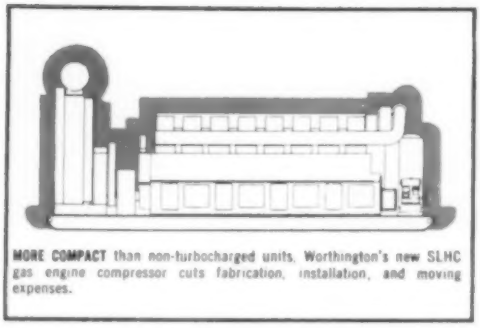

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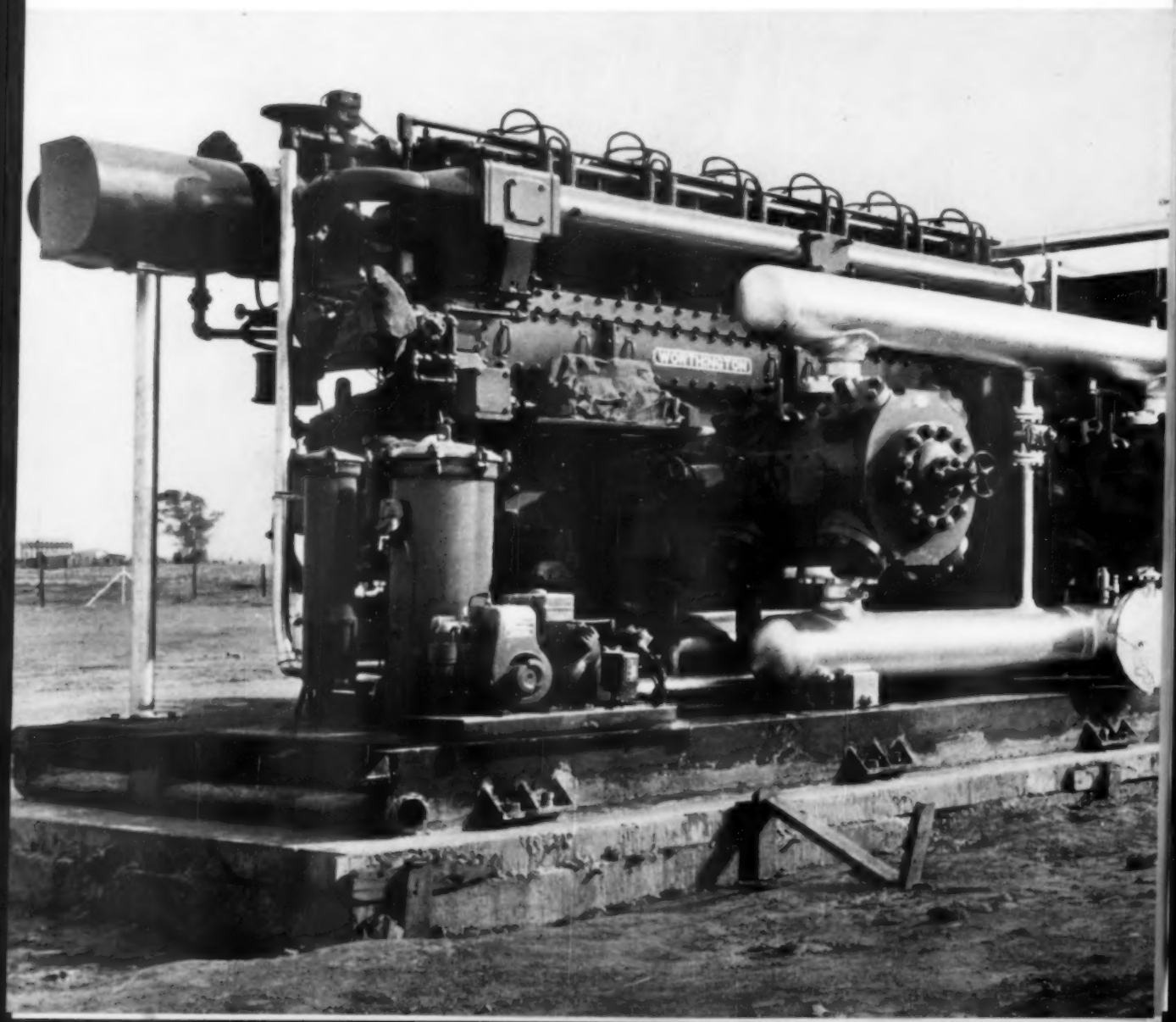

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WORTHINGTON

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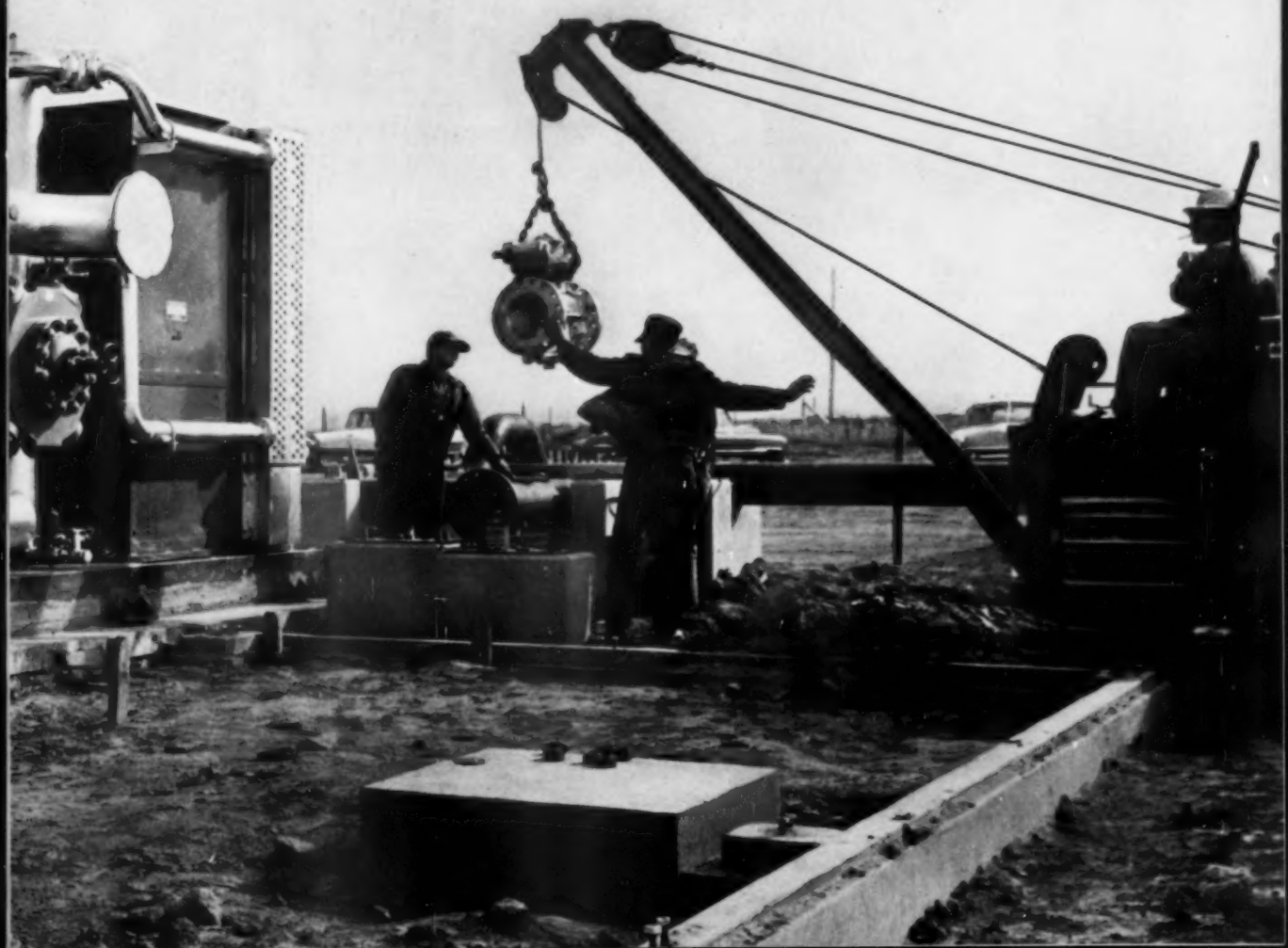

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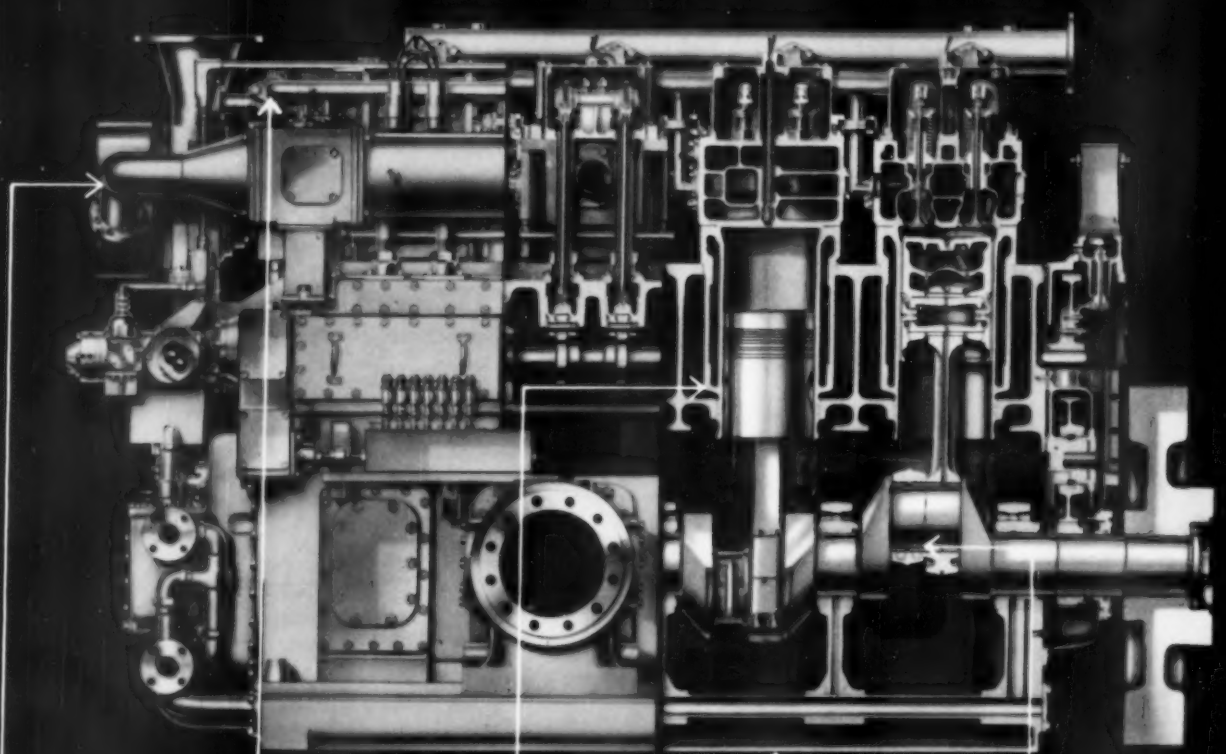

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Moving oil from Iraq—that's . . .

Big Job Handed Jersey's Fisher

STANDARD OIL CO. (N. J.) is furnishing one of its top executives, H. W. (Bud) Fisher, to help with one of the toughest oil jobs in the world—directing production operations for Iraq.

Vermont-born Fisher, whose administrative talents have been used for 30 years by Jersey Standard, is now breaking in as joint managing director of Iraq Petroleum Co., Ltd., and affiliated companies.

He dropped his duties as Jersey's ranking man in Europe to devote full time to I.P.C. The position is the highest ever held by an American in the British-based group of companies. London is the headquarters.

As a key management man in the I.P.C. operation, Fisher must wrestle such mountainous—yet delicate—problems as moving oil from land-locked Iraq to tidewater through hundreds of miles of pipelines crossing foreign territory.

Only last year I.P.C.'s pipeline pumping stations were sabotaged in Syria during the Israeli-Egyptian battling. Output in Iraq, normally 700,000 bbl. daily, still has not recovered.

I.P.C.'s operations include not only Iraq but also production of 125,000 bbl. daily in Qatar and exploration in Trucial areas of southern Arabia.

Although Fisher is now a crude-oil man, his wide experience and training did not hint at this role. He has held top administrative jobs with Jersey for most of three decades—but never on the producing end.

Up from M.I.T. . . . Fisher earned a chemical engineering degree at Massachusetts Institute of Technology and joined Jersey in 1927 after graduation. More than a dozen other M.I.T. graduates and instructors took the same step, and the group set up a research laboratory at Baton Rouge, La., to study coal and oil hydrogenation processes.

Two years later Fisher went to Linden, N. J., where the first large-scale hydrogenation unit was built.

Jersey Standard soon discovered Fisher was a talented executive and began shifting him among its varied operations on the theory that, in the upper levels of management, it's the man and not his special field that counts.

For many years Fisher shifted back and forth from Esso Standard to Esso Research and devoted more and more time to manufacture and sale of petrochemicals. In 1945 he moved in as a director of Esso Standard and the president of Enjay Co., Jersey's chemical sales company.

H. W. (BUD) FISHER
. . . Key man in a key position

Then the rising Vermonter moved into the foreign field for the first time by taking a business trip to Europe to study postwar petrochemical possibilities in England and France.

Refineries next . . . In 1948 came another shift. He took over as manager of Esso's East Coast refineries and joined the parent company the next year as deputy refining coordinator. By 1951 he was refining coordinator for Jersey's world-wide operations.

Since then Fisher has been directly involved with foreign work. He represented Jersey interests in the United Kingdom and was the company's chief contact on Middle East oil matters.

Jersey has an interest in both I.P.C. and Iranian Oil Participants, Ltd., the consortium company, and Fisher was Jersey's director in the consortium until early 1957. He also served until this year as chairman of Jersey's coordination committee for Europe, which works on long-range oil-supply problems for Europe.

Fisher has many bosses in his new job. Jersey and Socony Mobil jointly own 23¾ per cent of I.P.C. The biggest owners are Royal Dutch-Shell, British Petroleum Co., Ltd., and Cie. Francaise des Petroles, each with 23¾ per cent. The Gulbenkian estate holds the remaining 5 per cent.

Fisher is well fitted to handle the big task ahead. A medium-sized compact man, he has an easy manner. He moves lightly with spring and decision. And he can laugh.

Fisher and his family will remain in London, where they have lived since 1954.

Gerald E. Sherrod has been appointed senior petroleum engineer for First National City Bank of New York. Formerly he was a staff engineer with Texas Pacific Coal & Oil Co. of Fort Worth.

J. J. Wright has been appointed exploration superintendent at Midland, Tex., for Coronet Oil Co. Wright, who has been Coronet's district geologist at Lafayette, La., replaces **R. N. Williams** at Midland. Williams has resigned to take a position with the government of Chile.

Thomas Brownfield, Tulsa, and **Dr. Robert K. Dix,** Baton Rouge, have been elected directors of Interstate Oil Pipe Line Co., Shreveport. Brownfield is vice president and a director of Carter Oil Co. Dix is assistant general manager of the Esso Standard Oil Co. refinery at Baton Rouge.

F. A. Bush and **Carl G. Drescher** have been elected vice presidents of Sinclair Oil Corp. They will serve in New York as executive assistants to **F. L. Steiniger,** executive vice president for operations. Bush will work with production and research and Drescher with foreign operations, exclusive of Venezuela, and with the purchase and sale of foreign crude oil. Bush has been a vice president and director of Sinclair Oil & Gas Co. and is a director of Sinclair Research Laboratories, Inc. Drescher joined Sinclair last September upon his retirement as a rear admiral, U. S. Navy. He has served as assistant director of foreign operations, exclusive of Venezuela.

F. A. BUSH

C. G. DRESCHER

Personals

Dr. Maynard M. Stephens, oil consultant and author of several petroleum books, has been named dean of the School of Petroleum and Physical Sciences at Midwestern University, Wichita Falls, Tex. Stephens is the owner of Associated Petroleum Engineers, Wichita Falls consulting firm, and is an independent producer. He also has served as professor of geology at Midwestern.

R. E. Goodell has resigned as area scout at Billings for Phillips Petroleum Co. to direct exploration and development for Empire State Oil Co., at Thermopolis, Wyo.

E. H. (Ed) Shuler has been named manager of production for the Tidewater Oil Co. group at Regina to succeed **W. E. Perkes,** who has been transferred to Tidewater's Tulsa office. Shuler has been serving as assistant to the senior vice president of Tidewater at San Francisco.

G. S. Peterson has been named chief engineer for the U. S. Oil & Refining Co. at Tacoma, Wash. Formerly he was process group leader for Union Oil Co. of California at Wilmington, Calif.

Robert E. Rettger and **Wallace Ralston** have been named assistant chief geologists in Sun Oil Co.'s southwest production division at Dallas. Rettger has been geophysical coordinator in the geological department. Ralston has been regional geologist for West Texas and New Mexico.

G. L. Ballantine, oil and gas consultant at Charleston, W. Va., has been elected president of the Appalachian Geological Society for 1957-58. New vice presidents are **Robert E. Bayles,** Hope Natural Gas Co., Clarksburg, W. Va., northern area; **Byron M. Finch,** oil and gas consultant, Charleston, W. Va., central area; **W. G. Smith,** Kentucky-West Virginia Gas Corp., Ashland, Ky., southern area. Other officers: **Alexander H. Smith,** Owens, Libbey-Owens Gas Department, Charleston, W. Va., secretary-treasurer; **H. Douglas Preble,** Columbian Carbon Co., Charleston, W. Va., editor; and **Harry W. Adams,** McJunkin Corp., Charleston, W. Va., associate vice president.

Allen R. Steinert has joined George L. Buckles Co., Monahans, Tex., as an engineer. Formerly he was an engineer with Phillips Petroleum Co. at Corpus Christi.

W. E. Brown has retired as superintendent of compressor design engineering for Texas Gas Transmission Corp. at Owensboro, Ky. Brown has been employed by Texas Gas since 1949 and has spent 50 years in engineering. He and his wife will live in retirement at Kansas City, Mo.

Robert B. Laughlin has been named executive vice president of the Rocky Mountain Oil and Gas Association at Casper to replace **F. E. Woodring,** resigned. Laughlin, an attorney, formerly was on the legal staff of Pan American Petroleum Corp. at Casper.

R. F. FAULL

R. F. Faull, director of the La Habra Laboratory of California Research Corp., has been appointed vice president in charge of oil-field research for the corporation, a subsidiary of Standard Oil Co. of California. Faull succeeds **J. H. Thacker,** recently elected president of Iran-California Oil Co. **Alex Hildenbrand,** manager of producing research at the La Habra laboratory, was named to succeed Faull as director. **R. E. Loeck** takes Hildenbrand's former job, and **N. A. Riley** was named assistant laboratory director and manager of exploration research.

Douglass M. Stewart has been promoted from assistant division petroleum engineer with Humble Oil & Refining Co., Corpus Christi, to production engineer for the economics section of the producing coordination department of Standard Oil Co. (N. J.).

Alton B. Cook, research petroleum engineer for the U. S. Bureau of Mines at Bartlesville, Okla., has returned from a 6-week lecture and consulting assignment with the French Petroleum Institute and French oil companies. Cook spoke on oil recovery problems during the tour. A seminar on oil recovery was conducted in Paris by the French Petroleum Institute during Cook's stay in France.

Gay V. Land, manager of the oil department of Climax Molybdenum Co. for the past 3 years, has been elected a vice president of the company. Land joined Climax in 1950 when the oil department was organized. He previously had been with Carbide & Carbon Chemical Corp. and Socony Mobil Oil Co., Inc.

W. E. Dole, Carter Oil Co. geophysicist, has been transferred from Tulsa to Oklahoma City.

W. S. Richardson has joined Petroleum, Inc., as a geologist at Oklahoma City. Formerly he was associated with W. C. McBride, Inc., Tulsa.

Ronald L. Afdahl, mechanical engineer for Phillips Petroleum Co., has been transferred to Oklahoma City from Bozeman, Mont.

Edgar B. Krider has been named assistant general superintendent for National Cooperative Refinery Association, at Great Bend, Kans. Krider, a petroleum engineer, formerly was with Midstates Oil Corp. and Provincial Oil Corp.

Stanley D. Michaelson of Salt Lake City has been nominated for 1958 president of the Society of Mining Engineers of the A.I.M.E. Michaelson will serve also as a director of A.I.M.E. He is chief engineer in the western mining division of Kennecott Copper Corp.

James C. Mahaffy has been appointed general manager of Alberta Gas Trunk Line Co., Ltd., the firm which will collect Alberta natural gas for delivery to Trans-Canada Pipe Line Co., Ltd. Mahaffy, a Calgary attorney and former provincial royal commission chairman, has been secretary-treasurer of the trunk line company and succeeds **W. F. Knode,** who has retired as general manager.

Fred S. Goddard has been named assistant district superintendent for Sunray Mid-Continent Oil Co. at Corpus Christi. He has been assistant to the production superintendent at Tulsa for the past 2 years. **Fred McDaniel,** who has held the Corpus Christi post, will take over Goddard's old job at Tulsa. The switch is part of Sunray's program of transferring field men to the Tulsa general offices for management training and then returning them to their districts.

Personals

Robert Buxton, Billings scout for The Texas Co., has resigned to become an independent operator at Denver.

William H. Tisdall has been promoted to district geologist in the Calgary and Regina offices of Sun Oil Co.'s Canadian production division. He has been in the Calgary office since 1951.

William P. (Bill) Whitmore has been promoted from area production superintendent to executive assistant for Skelly Oil Co. at Tulsa. Promoted to succeed Whitmore is **Mark Sykes,** Gulf Coast district production superintendent at Bay City, Tex. **Boorksy Smith,** district foreman at Bay City, succeeded Sykes.

John H. Loudon has been elected board chairman of Shell Oil Co. to succeed **Sir Francis Hopwood,** who retired June 30. **F. J. Stephens** was elected to the board vacancy created

JOHN H. LOUDON

F. J. STEPHENS

by Hopwood's retirement. Loudon is president of Royal Dutch Petroleum Co. and board chairman for Shell Caribbean Petroleum Co. Stephens is a managing director of Shell Transport & Trading Co., Ltd., Shell Petroleum Co., Ltd., and N. V. De Bataafsche Petroleum Mij.

LeRoy Lane, production engineer with Sinclair Oil & Gas Co. in Corpus Christi, Tex., has been transferred to Santa Barbara, Venezuela, as production engineer with Sinclair Oil & Refining Co.

Lewis J. Hubka, Jr., Houston, has resigned as chief geologist for Beck Oil Co. in Houston to become an oil consultant. He will specialize in geology of the Texas and Louisiana Gulf Coast area. He is a former division geologist for Shell Oil Co.

James W. Greely, a former Navy Commander specializing in ship salvage, has been named general marine superintendent for Kerr-McGee Oil Industries, Inc. He succeeds **Leo P. LeBron,** who has taken charge of Kerr-McGee's Venezuelan drilling operations. Greely's headquarters will be at Morgan City, La.

Allen Ehlers has resigned as chief geologist for American Trading & Production Corp., Midland, Tex., to open offices at Midland as an independent.

Robert P. Evans has resigned as regional manager for Lion Oil Division of Monsanto Chemical Co. at Wichita, Kans., to become vice president in charge of exploration of Kin-Ark Oil Co., El Dorado, Ark. Evans also will be a director of Kin-Ark.

Robert Dyk has been appointed chief geophysicist of Tidewater Oil Co. at San Francisco. The job is newly created. Dyk has served as manager of the Mid-Continent division of Geophysical Service, Inc., Denver, and from 1947 to 1951 was geophysical supervisor for General Petroleum Corp., Bakersfield, Calif. Prior to that he was associated with Western Geophysical Co., Los Angeles.

Billy Joe Moore has joined Gosden Petroleum Corp. as manager of its exploration office at Midland, Tex. Moore resigned as division landman for Texas Pacific Coal & Oil Co. to take the new post. Moore has worked 13 years for Texas Pacific in West Central Texas, the Rockies, the Fort Worth general office, and, for the past 6 years, at Midland.

O. F. Van Beveren has been named vice president and board member of Standard Oil Co. of California, Western Operations, Inc. Van Beveren recently has been on leave to serve as special consultant for exploration for the parent company, Standard Oil Co. of California. He now returns as general manager of the exploration department of Western Operations.

DEATHS

J. P. Troll, 77, retired Tulsa independent oil producer, died July 28 at his home following a long illness. Troll formerly was in the oil-field manufacturing business in Butler, Pa., and Mount Pleasant, Mich., and was an independent producer in Oklahoma.

Walter Stanley Johnson, 58, senior clerk for Service Pipe Line Co., Tulsa, died July 28 after a 6-month illness.

LaRue Smith, Sr., 67, Great Falls, Mont., oil and gas executive, died recently after undergoing surgery. Smith, an attorney, was president of Hardrock Oil Co., Montana Gas Corp., Treasure State Pipe Line Co., Consumers Gas Co., Triangle Co., and Kevin Natural Gas Co. He drafted the Montana state oil lease law enacted 4 years ago.

Joseph W. Moorman, 46, Tulsa, consulting engineer, died July 27. Moorman, a native of Terra Haute, Ind., had been a consultant at Tulsa since 1950. He also was a night class instructor on catalytic cracking at Tulsa University.

A. E. (Art) McMillen, 50, independent operator at Haskell, Tex., died July 28 in a Dallas hospital. McMillen drilled the discovery well of Parvue field in southern Haskell County, West Texas.

R. A. Broomfield, 85, retired vice president of Barnsdall Oil Co., died July 29 at Los Angeles. Broomfield was manager of Barnsdall's California division until his retirement in 1941.

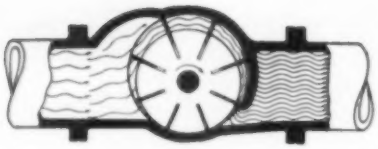
James F. Ross, 80, veteran Texas and California oil man, was killed July 27 when he fell off a cliff at his home at Laguna Beach, Calif. Ross was president of the Amigos Oil Co., Laredo, Tex. The fatal accident occurred as Ross was raking leaves in the yard.

Abbott B. Jenks, 61, owner of Guadalupe Drilling Co., Midland, Tex., died July 29 at Midland. He formerly was production superintendent for Fullerton Oil Co. in California and Superior Oil Co. in Texas before organizing his own drilling firm.

John C. Askam, 63, assistant to the vice president of Ohio Oil Co., died of a heart attack July 29 at Findlay, Ohio. Askam joined Ohio in 1916 as an engineer. He was named assistant to the vice president of administrative services in March 1956.

Donald D. Golden, Casper, Wyo., division landman for Richfield Oil Corp., died recently while on a fishing trip in northwestern Wyoming.

Bruce Cameron Hall, 61, assistant drilling superintendent for Signal Oil & Gas Co., died July 25 at Long Beach.



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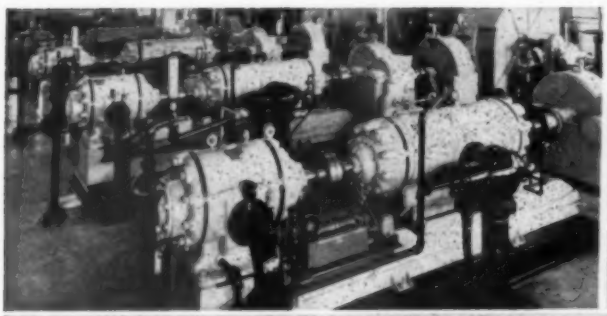
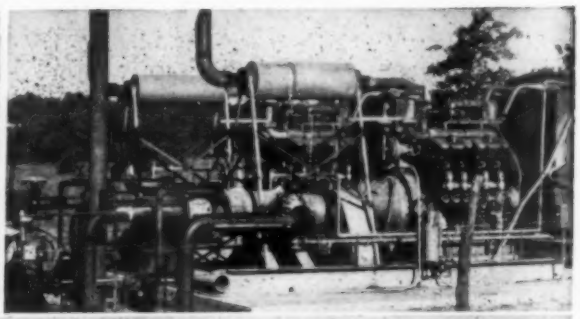


IN-PLANT SERVICES



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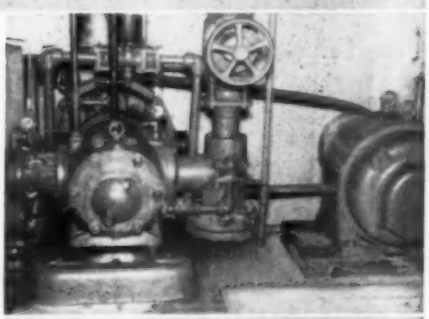

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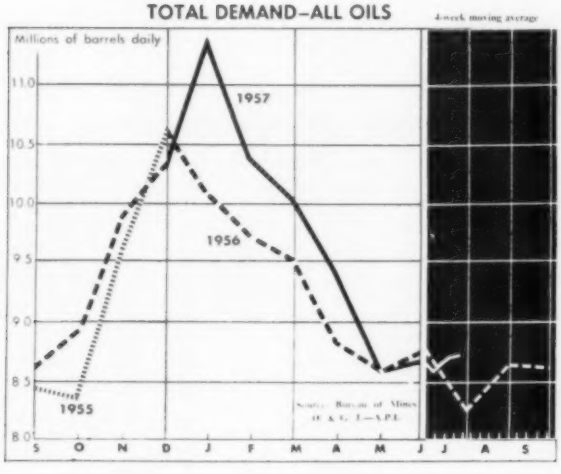
Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,908,950	DOWN	24,650	DOWN	187,073
Crude stocks	285,882,000	UP	5,424,000	UP	10,955,000
Completions	1,081	DOWN	43	DOWN	81
Refinery Runs	7,763,000	UP	14,000	DOWN	227,000
Gasoline stocks	175,698,000	DOWN	2,569,000	DOWN	1,354,000
Kerosine stocks	30,611,000	UP	984,000	UP	1,728,000
Distillate stocks	133,822,000	UP	4,024,000	UP	20,222,000
Residual stocks	48,737,000	UP	423,000	UP	5,569,000
Four-product stocks	388,868,000	UP	2,862,000	UP	26,165,000
Total imports	1,657,400	UP	186,900	UP	212,500



Product Markets Are Listless, Waiting for Shifts in Demand

PETROLEUM product markets continue to drift. The rate of change may vary from week to week, but the direction hasn't changed for the past few weeks.

Stocks of distillate fuels are much too high. The surplus material in refinery and terminal storage is adding to the pressure on kerosine and distillate prices.

Almost all available primary distillate storage on the East Coast has been filled. Some of the large unbranded distributors on the East Coast have been holding off on buying, waiting to catch the market at its lowest point of the season.

Market gossip is to the effect that these distributors are looking for still another reduction in the light-fuel market on the East Coast. At least the lack of movement to secondary storage indicates that they see no advantage in buying at current prices.

Many refiners will soon be short on clean storage if stocks continue to pile up. Total kerosine and distillate inventories amounted to 164,444,000 bbl. on July 26 compared to 144,777,000 bbl. at the end of July last year. This surplus is a factor in the over-all refining problem. High distillate stocks will delay the return to high refinery runs.

Reduced refinery input will tend to strengthen the gasoline market. Gasoline prices have not moved up but the market is losing some of the distress material that has been hanging over it for almost a year.

The table at the bottom of the page shows the trend in gasoline stocks as well as the changes in summer demand. Note that gasoline stocks at the end of July will be under last year, but stocks were too high last year. July gasoline stocks dropped in 1955, went way up in 1956, and will be down slightly in 1957.

Gasoline demand was off from previous year for both May and June. The July average will be up but not enough to cover a normal increase as well as the losses in the other 2 months. If any of the early loss was due to a shift in vacations, August should be a good month.

Pennsylvania Grade crude prices dropped 23 cents a barrel, effective July 26. The new posting for Bradford crude is $4.65 a barrel. This is the first decrease since September 1954.

TRENDS IN GASOLINE STOCKS

(Thousands of barrels)

	1954	1955	1956	1957
January 1	157,872	155,400	165,433	187,271
January 31	171,704	169,562	183,905	197,702
February 28	179,950	181,643	196,092	205,270
March 31	181,297	183,972	199,698	206,716
April 30	177,006	175,601	193,299	201,407
May 31	177,606	168,751	186,673	195,000
June 30	165,404	157,439	177,076	187,000
July 31	158,010	157,079	176,536	*175,698
August 31	153,168	151,912	172,939	
September 30	150,916	150,194	177,974	

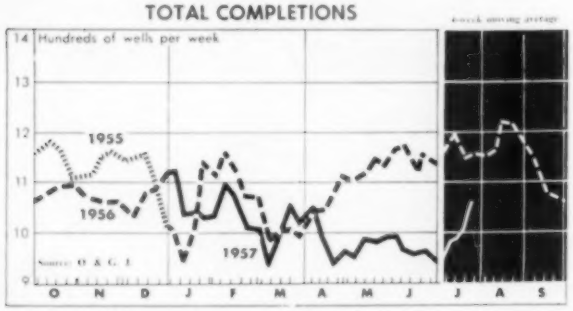
*For July 26.

TOTAL GASOLINE DEMAND

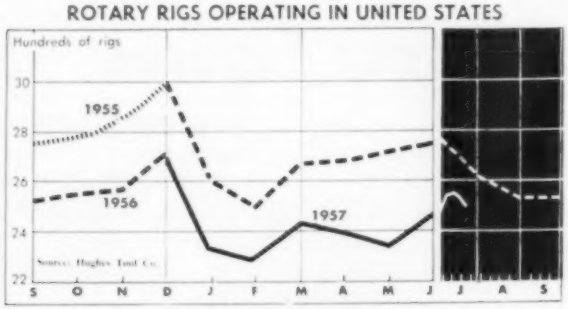
(Thousands of barrels daily)

	April	May	June	July	August
1952	3,397	3,323	3,393	3,512	3,421
1953	3,473	3,454	3,843	3,690	3,541
1954	3,532	3,444	3,877	3,702	3,629
1955	3,818	3,868	4,145	3,880	4,066
1956	3,859	4,095	4,331	4,021	4,171
Five-year average	3,616	3,637	3,918	3,761	3,766
1957	3,955	4,050	4,230		

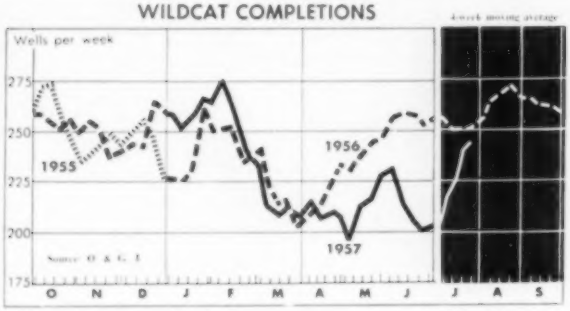
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	7-29-57	7-22-57	7-30-56
North Central and East	101	112	127
Southeast	34	40	35
Oklahoma, Kansas, Arkansas, Missouri	445	461	431
Louisiana	419	435	456
North and East Texas-Panhandle	368	370	357
Gulf and South Texas	179	203	258
West Texas-New Mexico	525	538	489
Rocky Mountain	261	259	279
Pacific Coast	108	105	104
Total United States	2,440	2,523	2,536
Canada	192	200	247

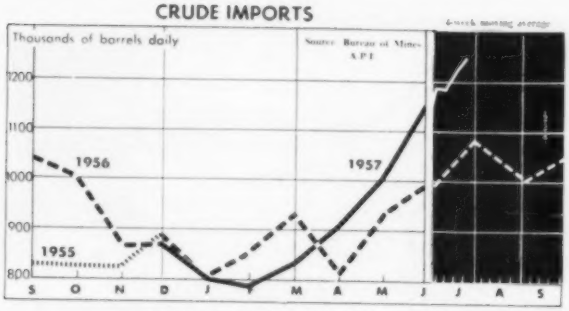
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 27, 1957

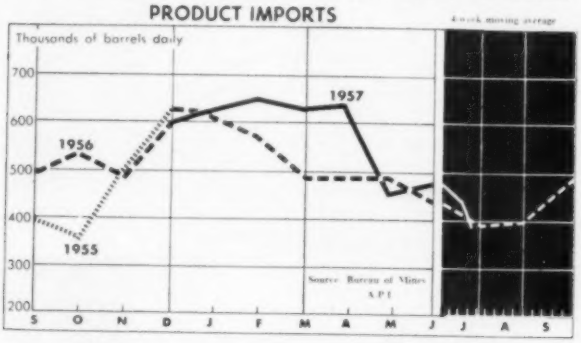
	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1957	1956	Total	Crude	Cond.	Gas	Dry	1957	1956
Alabama	3	1	0	0	2	0	17,422	56	‡63	2	0	0	0	2	16	‡30
Arkansas	33	24	0	0	9	0	110,018	606	449	4	0	0	0	4	108	105
California	46	26	0	5	15	0	206,733	1,215	1,261	16	1	0	1	14	303	278
Colorado	16	5	0	2	9	0	76,490	485	675	11	2	0	1	8	327	330
Illinois	47	16	0	0	31	0	100,707	1,375	2,167	13	0	0	0	13	351	422
Indiana	11	3	0	0	8	0	22,135	340	363	0	0	0	0	0	68	78
Kansas	64	27	0	4	32	1	215,967	2,361	2,952	15	0	0	0	15	472	620
Kentucky	35	11	0	5	19	0	47,860	779	1,002	6	0	0	1	5	155	231
Louisiana	84	43	0	8	33	0	577,079	2,154	2,230	12	3	0	0	9	388	435
North	35	23	0	3	9	0	111,110	740	921	3	0	0	0	3	99	137
South	36	15	0	4	17	0	347,957	1,002	1,050	6	2	0	0	4	237	252
Offshore	13	5	0	1	7	0	118,012	412	259	3	1	0	0	2	52	46
Michigan	2	0	0	0	2	0	5,323	227	260	1	0	0	0	1	90	92
Mississippi	3	0	0	0	3	0	18,635	212	254	3	0	0	0	3	111	118
Montana	7	4	0	0	3	0	35,439	219	214	3	1	0	0	2	77	70
Nebraska	28	8	0	0	20	0	161,131	488	586	17	0	0	0	17	275	285
New Mexico	43	20	0	12	11	0	213,417	1,195	1,085	6	1	0	0	5	156	134
Northwest	13	2	0	9	2	0	46,973	460	427	1	0	0	0	1	54	38
Southeast	30	18	0	3	9	0	166,444	735	658	5	1	0	0	4	102	96
New York	9	4	0	0	0	5	9,250	259		0	0	0	0	0	2	
North Dakota	4	1	0	0	3	0	25,168	157	140	3	0	0	0	3	65	40
Ohio	18	8	0	4	6	0	35,554	597	569	1	0	0	0	1	6	6
Oklahoma	113	68	2	6	34	3	362,371	3,504	4,951	6	1	0	0	5	396	525
Pennsylvania	0	0	0	0	0	0	0	385	†627	0	0	0	0	0	36	†15
Texas	475	296	9	7	159	4	1,968,148	12,423	12,670	103	10	2	2	89	3,120	3,254
District 1	35	21	0	0	14	0	81,297	719	*7,866	9	2	0	0	7	247	*629
District 2	21	5	6	1	9	0	131,717	425	*1,527	6	0	1	0	5	166	*496
District 3	26	17	1	0	8	0	124,710	1,023		12	1	1	1	9	302	
District 4	27	9	0	0	18	0	122,033	807		7	1	0	0	6	281	
East	29	15	0	0	14	0	110,326	722	633	11	0	0	0	11	224	242
District 7-B	58	30	0	3	25	0	193,421	1,619		21	3	0	1	17	590	
West	123	103	0	0	20	0	673,936	3,522	3,325	14	2	0	0	12	516	544
District 9	116	65	1	1	45	4	358,059	2,774	*4,567	20	1	0	0	19	734	*1,275
District 10	40	31	1	2	6	0	172,649	812	752	3	0	0	0	3	60	68
Utah	3	1	0	0	2	0	8,784	108	72	1	0	0	0	1	59	42
West Virginia	13	1	0	10	2	0	32,260	355	366	1	0	0	0	1	17	13
Wyoming	24	4	0	2	16	2	104,547	467	459	10	0	0	1	9	158	128
Miscellaneous	0	0	0	0	0	0	0	57	64	0	0	0	0	0	40	56
Total U. S.	**1,081**	571	11	65	419	15	4,354,438	30,024	33,479	**234**	19	2	6	207	6,796	7,307
Total prev. week	1,124	556	15	85	441	27	4,621,219			281	32	1	5	243		
Cum. 1957	30,024	15,696	256	2,179	11,261	632	125,189,116			6,796	727	61	266	5,742		
Western Canada	79	48	0	3	28	0	361,980	1,751	1,607	27	5	0	2	20		

*Districts: 2 & 3, 1 & 4, 9 & 7-B, formerly combined. †Incl. New York. ‡Incl. Florida and Georgia.

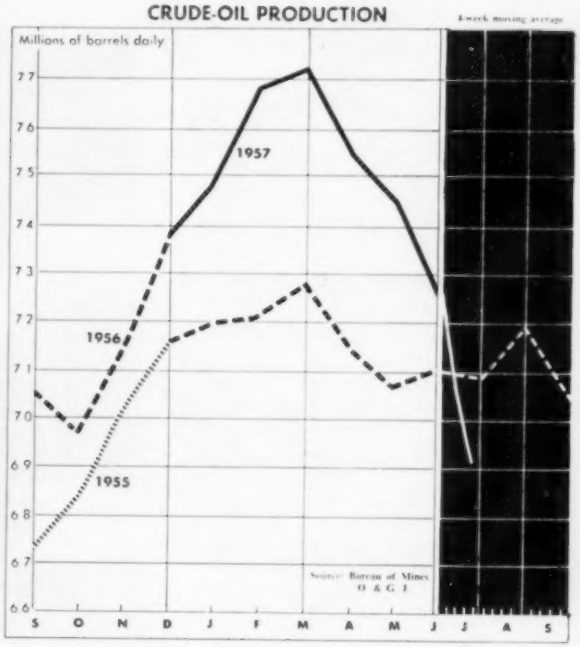
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

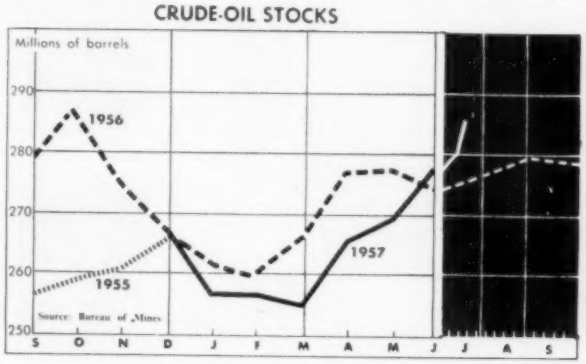


DAILY AVERAGE PRODUCTION FOR WEEK

	July 27, 1957			July 20
	Crude oil	Lease condensate	Total	total
Alabama	13,700	.....	13,700	13,650
Arkansas	84,000	400	84,400	84,400
California	930,400	.....	930,400	926,800
Colorado	153,300	.....	153,300	152,250
Eastern	51,300	.....	51,300	51,700
Florida	1,350	.....	1,350	1,350
Illinois	157,800	.....	157,800	151,800
Indiana	28,000	.....	28,000	27,700
Kansas	†348,300	.....	†348,300	†363,000
Kentucky	39,300	.....	39,300	39,400
Louisiana	796,800	74,800	871,600	871,700
North	124,800	2,800	127,600	127,700
South	672,000	72,000	744,000	744,000
Michigan	24,100	.....	24,100	27,400
Mississippi	110,150	4,200	114,350	114,350
Montana	73,450	.....	73,450	72,650
Nebraska	50,300	.....	50,300	49,650
Nevada	100	.....	100	100
New Mexico	250,000	4,400	254,400	254,500
North Dakota	35,000	.....	35,000	39,300
Oklahoma	†583,400	.....	†583,400	†601,000
Texas	2,741,000	53,700	2,794,700	2,794,700
Dist. 1	52,000	450	52,450	52,450
Dist. 2	126,000	8,450	134,450	134,450
Dist. 3	400,000	26,500	426,500	426,500
Dist. 4	210,000	6,100	216,100	216,100
Dist. 5	36,000	300	36,300	36,300
Dist. 6	122,000	6,300	128,300	128,300
East Texas field	173,000	.....	173,000	173,000
Dist. 7-B	151,000	50	151,050	151,050
Dist. 7-C	140,000	3,650	143,650	143,650
Dist. 8	1,025,000	1,100	1,026,100	1,026,100
Dist. 9	201,000	500	201,500	201,500
Dist. 10	105,000	300	105,300	105,300
Utah	9,950	.....	9,950	10,500
Wyoming	289,650	.....	289,650	285,600
Others	‡100	.....	‡100	‡100
Total U. S.	6,771,450	137,500	**6,908,950**	6,933,600
Change from prev. week, down			**24,650**	
Canada	†568,300	.....	†568,300	†567,400
Total U. S. Prod.-Jan. 1-July 27				1,548,301,650 bbl.
Same period last year (crude plus cond.)				*1,495,513,269 bbl.

*Includes 26,088,455 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

CRUDE-OIL STOCKS



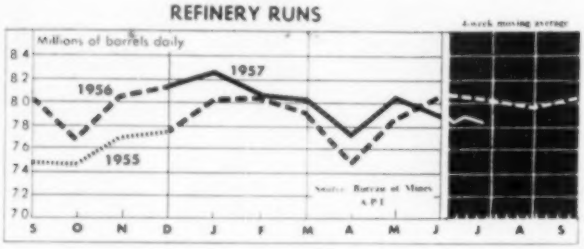
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

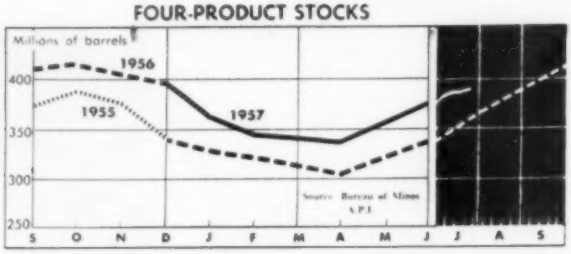
	7-20-57	7-13-57	7-21-56
Pennsylvania Grade	2,954	2,905	2,545
Other Appalachian	1,503	1,492	2,264
Illinois, Indiana, Michigan	11,133	10,263	10,491
Nebraska, North Dakota	2,621	2,264	2,572
Kansas	11,433	11,135	9,770
Oklahoma	21,147	22,047	27,248
Arkansas	3,499	2,532	2,900
Louisiana	19,454	18,922	15,289
North	3,888	3,013	2,618
South	15,566	15,909	12,671
Mississippi, Ala., and Fla.	2,627	2,642	2,897
New Mexico	8,636	8,643	8,087
Texas	130,490	128,314	121,960
East Texas proper	10,177	10,946	9,454
West Texas	63,801	63,305	59,414
Texas Gulf	24,895	23,901	22,047
Other Texas	31,617	30,162	31,045
Wyoming	17,808	17,560	19,592
Other Rocky Mountain	6,572	6,419	7,034
California	29,348	28,195	27,703
Foreign	†16,657	17,125	14,575
Total	285,882	280,458	274,927

*Bureau of Mines. †Includes 4,339,000 bbl. in California.

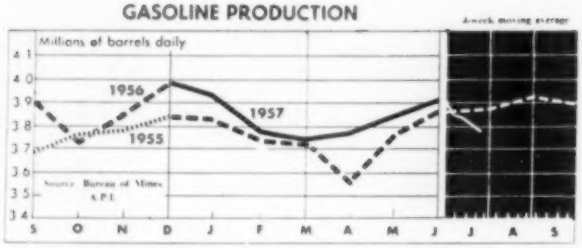
REFINERY RUNS



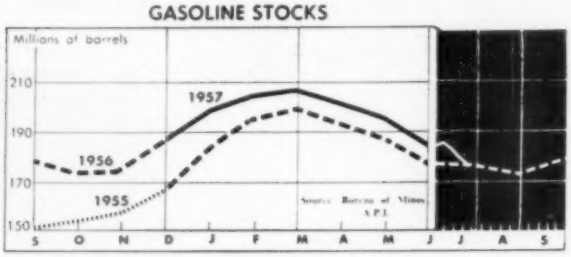
FOUR-PRODUCT STOCKS



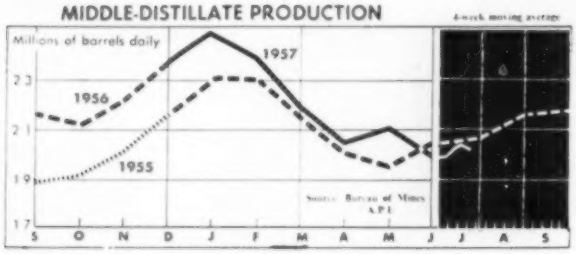
GASOLINE PRODUCTION



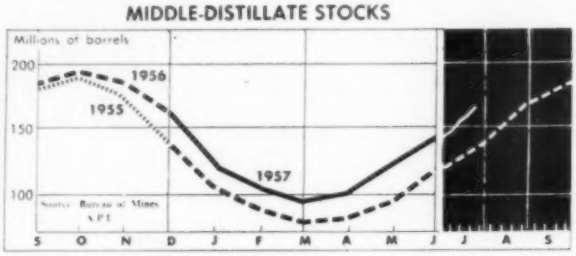
GASOLINE STOCKS



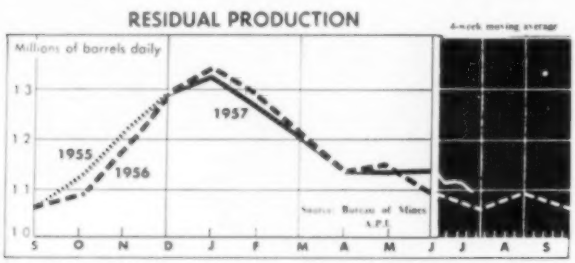
MIDDLE-DISTILLATE PRODUCTION



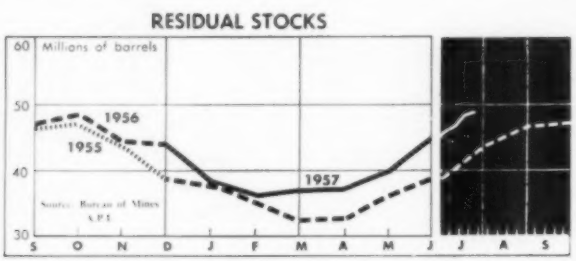
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, JULY 26, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, July 1956 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,211	496.3	41.8	319.6	238.6	41,358	12,337	47,531	12,203	1,164	472.5	26.2	313.4	196.9
Appalachian:														
District 1	100	45.4	2.4	21.9	2.9	4,462	566	2,714	515	107	42.2	4.4	24.2	5.5
District 2	48	29.9	2.0	7.6	7.4	2,428	467	771	241	100	53.3	4.6	14.3	11.9
Ind., Ill., Ky.	1,278	685.4	59.9	249.3	155.4	30,551	6,007	19,673	6,114	1,375	718.2	79.7	261.4	144.5
Minn., Wis., Dak.	104	47.3	4.9	31.3	8.7	5,494	1,352	6,772	425	92	46.7	7.2	24.3	4.0
Okla., Kans., Mo.	737	395.0	19.6	164.1	24.0	14,932	1,589	12,006	1,031	724	390.6	18.7	162.9	27.3
Inland Texas	279	220.4	10.4	46.0	22.0	6,831	435	2,569	1,894	273	193.9	10.1	42.8	24.3
Texas Gulf Coast	1,834	879.8	82.9	465.1	233.0	23,136	3,088	15,357	7,217	1,914	926.5	91.5	479.9	251.1
La. Gulf Coast	664	344.6	37.4	165.1	43.1	10,268	3,262	6,764	1,488	713	359.7	39.7	181.9	40.9
N. La. and Ark.	87	35.0	4.3	20.4	5.3	3,819	849	1,956	150	103	37.9	6.8	22.9	6.2
Rocky Mountain:														
New Mexico	27	13.7	0.7	5.3	3.4	412	13	97	71	25	13.0	0.3	4.7	3.6
Other Rocky Mtn.	276	128.3	1.9	58.3	35.4	6,522	280	3,150	1,043	281	131.7	2.5	67.1	27.9
California	1,118	472.6	2.4	148.9	329.9	25,485	366	14,462	16,345	1,143	491.3	4.1	167.1	321.6
July 26, 1957	7,763	3,793.7	270.6	1,702.9	1,109.1	175,698	30,611	133,822	48,737	8,014	3,877.5	295.8	1,766.9	1,065.7
July 19, 1957	7,749	3,781.3	245.3	1,721.1	1,077.0	178,267	29,627	129,798	48,314	.....	.....	.....	.....	.....
July 27, 1956	7,990	3,924.9	314.3	1,804.6	1,089.9	177,052	28,883	113,600	43,168	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.25-11.75
Premium (98 octane)	14.00-14.50
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California (rack):	
Regular (88 octane)	13.1
Premium (96 octane)	15.1
Premium (98 octane)	15.8
Caribbean area (cargoes):	
Regular (87 octane)	10.875
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.0
Breckenridge:	
Grade 26-70	3.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-10.00
Diesel oil (58 d.i. and above)	9.125-9.75
Distillate No. 1	9.125-9.75
Distillate No. 2	8.50-9.00
Gulf Coast (cargoes):	
★ Kerosine 41-43	8.75-9.50
★ Distillate No. 2	8.75-9.50
New York Harbor (barges):	
Kerosine 41-43	11.15
Distillate No. 2	10.65
Diesel fuel, 48-52 d.i.	10.95
Caribbean area (cargoes):	
Distillate No. 2	9.25

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.85-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.50-2.75
New York Harbor (barges):	
Bunker C fuel	$3.05
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.89
16-16.9	2.74	....	....	....	1.94
17-17.9	2.78	....	....	....	1.99
18-18.9	2.82	....	....	....	2.04
19-19.9	2.85	....	....	....	2.09
20-20.9	2.89	$2.75	....	$2.62	2.14
21-21.9	2.93	2.77	....	2.64	2.19
22-22.9	2.97	2.79	....	2.66	2.24
23-23.9	3.01	2.81	$3.44	2.68	2.29
24-24.9	3.05	2.83	3.46	2.70	2.34
25-25.9	3.09	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, July 26, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
★ Bradford	4.65
★ Middle District	4.47
★ Southwest Pennsylvania	4.18
★ West Virginia	4.00
★ Buckeye Grade	4.00
★ Zanesville Grade	3.04
Illinois Basin	3.15
Canada:	
Leduc-Woodbend	2.78
Redwater (Alta.)	2.67
Smiley (Sask.)	2.44
Pembina	2.65

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
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OIL AND GAS MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 215 Littlefield Building, Austin 15, Texas.

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4-Corners Area. November Indian Lease sale brought 30 Million Dollars. Some leases sold for $3,200 per acre. Wells estimated up to 1500 barrels of oil per day. Oil Leases from $2.25 an acre. Fortunes being made. Write for free information now. **ATLAS OIL SURVEY, Dept. OJ-7,** Colorado Bldg., Denver 2, Colo.

Producing and Undeveloped

Oil and Gas Properties

In Kansas Offered For Sale

Apex Petroleum Corporation, Ltd., a California corporation, will offer at public sale at 10:00 a.m. on Wednesday, September 4, 1957, at Room 409, Schweiter Building, Wichita, Kansas, all of its interests in certain producing and undeveloped oil and gas properties comprising the following:

25% working interest in 5 producing oil wells on leases containing 168 acres in Ellis County.

50% working interest in 2 producing oil wells on leases containing 80 acres in Rice County.

31.25% working interest in 3 producing oil wells on leases containing 320 acres in Barton County.

33.33% working interest in 6 gas units comprising 640 acres each in Stanton County with 1 producing gas well located on each unit.

33.33% working interest in undeveloped leases containing 320 acres in Ellsworth and Russell Counties.

37.50% working interest in undeveloped leases containing 320 acres in Rice County.

37.50% working interest in undeveloped leases containing 1,788 acres in Reno County.

The sale will include the company's interest in all well equipment and personal property on or appurtenant to the leaseholds above-referred to.

The company reserves the right to refuse any and all bids received. The company makes no warranties other than as to the existence of the leases without default and of its right to transfer its interests therein. All bids must be accompanied by a deposit of cash or certified or cashier's check for $50,000 to be deposited with the company or in escrow pending consummation of the sale. Terms are 50% or more in cash payable at consummation of the sale against delivery of assignments of the company's interests and the balance, if any, payable within one year and secured by security satisfactory to the company. All bids made shall remain open for forty-eight hours for acceptance by the company and sale is to be concluded within fifteen days after acceptance. Any deposit made shall be forfeited as liquidated damages in the event of the failure of the purchaser to consummate the purchase after acceptance of his bid. Offers for all or any part of the properties held by the company will be considered.

Further information concerning these properties will be furnished to any responsible interested person upon request to

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ALBERTA

Southland-Greta 1 Hays, LSD 5, 14-12-14w4. TD 3,051 ft. Ellis oil well.

Canadian Export-Cree 6-16 WoodRiver, LSD 6, 16-43-23w4. TD 5,711 ft. D3 oil well.

Baysel-Crowsnest-Conick 11-14 Burbank, LSD 11, 14-39-27w4. TD 7,070 ft. D2 oil well.

H.B.-Pan American 11-34 Pine Creek, LSD 11, 34-57-19w5. TD 11,530 ft. D3 gas well.

SASKATCHEWAN

Imperial 13-26 Browning, LSD 13, 36-6-5w2. TD 2,250 ft. Mission Canyon oil well.

Husky D-3-1 Alberfeldy, LSD 3, 1-50-27w3. TD 1,805 ft. Sparky oil well.

Canadian Seaboard-Canso 10-33 Fusilier, LSD 10, 33-33-27w3. TD 3,133 ft. Indicated gas well.

CALIFORNIA

Glenn County: E. J. Doheny, 1 Section, 46 Unit, SE SE 22-20n-2w, 6,283 M.c.f. gas daily, 15/32-in. choke, perfs. 5,884-5,906 ft. TD 7,454 ft. (1 mile northeast extension to Beehive Bend field.)

Kern County: Tidewater Oil Co. 56 Giant, SW NE 19-30s-22e, IPP 100 BOPD, 18.6°, 9 per cent cut, perf. 1,036-1,506 ft., TD 1,592 ft. (New fault-block discovery in McKittrick field.)

ILLINOIS

Marion County: Rhea Fletcher 1 Tom Sawyer, NE SE SW 3-1n-3e. IPP 68 BOPD, McClosky 2,665-71 ft. TD 2,779 ft.

KANSAS

Barber County: Iron Drilling Co. 1-A Frisbee, SE SE SW 25-33s-10w. IP 3,300 M.c.f. gas, Mississippian 4,543-53 ft. Shut-in pressure 1,650 psi. TD 4,583 ft.

Butler County: Beaumont Petroleum Co. 1 Phares estate, NE NE NE 5-26s-3e. IPP 25 BOPD, 40°-gravity, Mississippian 2,757-58 ft. TD 2,843 ft.

Kingman County: Pickrell Drilling Co. 1 Wulf, SE SE NE 3-30s-7w. IP 2,822 BOPD, Mississippian 4,160-80 ft. TD 4,242 ft.

Russell County: Helmerich & Payne 1 Mortgenstearn, NW SE NE 4-15s-15w. IPP 128 BOPD, 40°-gravity, Lansing 3,195-3,319 ft. TD 3,463 ft.

SOUTH LOUISIANA

Acadia Parish: Bradco Oil & Gas Co. and Texas Eastern Transmission Co. 1 Zaumbrecher, 11-8s-1w. IP 129 BOPD, 7/64-in., 32.4°, GOR 752 cu. ft. per barrel, TP 1,100 psi., perf. 9,470-80 ft. TD 10,180 ft. (1 mile extension and new pay, Grand Coulee area.)

Calcasieu Parish: Sohio Petroleum Co. 4-C Sweet Lake, 34-10s-6w. IP 144 BOPD, ⅛-in., 36°, GOR 440 cu. ft. per barrel, TP 1,250 psi., perf. 11,908-13 ft. and 11,916-21 ft. TD 11,101 ft. (New pay in East Bell City field.)

St. Mary Parish: Phillips Petroleum Co. 2-A OCS-O473, Blk 191, Eugene Island area, Gulf of Mexico. IP 672 BOPD, ⅜-in., 32.8°, GOR 700 cu. ft. per barrel, TP 2,575 psi., perf. 8,670-8,710 ft. (Miocene). TD 11,125 ft. (Discovery well southwest flank Blk. 118 salt dome.)

OKLAHOMA

Garvin County: Jake L. Hamon 1 Mays, NW NW SW 24-3n-1w. IP 168 BOPD, 12/64-in., 35°-gravity, second Bromide 4,114-16 ft. TD 5,200 ft.

Kay County: Pure Oil Co. and Amerada Petroleum Corp. 1 Chilocco, SW SW NE 14-29n-2e. IP 56 BOPD, 22/64-in. 38°-gravity, Red Fork 3,368-87 ft. TD 3,480 ft.

Woods County: Amerada Petroleum Corp. 1 Krob, NW SE SW 24-25n-13w. IP 257 BOPD, ¼-in., 37°-gravity, Simpson 7,060-90 ft. TD 7,451 ft.

NORTH TEXAS

Grayson County: A. O. Phillips 2 J. H. Green, John Murphy Sur., A-798, 8 mi. N Whitesboro, ½ mi. N production. IP 143 BOPD, 17/64-in., 40-gravity, GOR 450, TP 40 psi., 5,630-ft. sand, perforated 5,641-78 ft. TD 6,357 ft.

Montague County: Cheyenne Oil Corp. 1 L. N. Husband, Sec. 18, C. Boger Sur., A-65, 4 mi. NW St. Jo. IP 1,358 BOPD, ½-in., 40-gravity, GOR 402, TP 310 psi., top Bend conglomerate pay 6,468 ft., perforated 6,468-87 ft. TD 7,100 ft., elev. 1,177 ft.

TEXAS PANHANDLE

Ochiltree County: Baker & Taylor 1 Powers. Section 652, H&TC Survey. IP 19,000 M.c.f. gas, plus 9 bbl. per M.c.f., 60°-gravity, Douglas 5,720-40 ft. TD 5,840 ft. Extension well.

SOUTHWEST TEXAS

Brooks County: Mills Bennett Estate 42 Mills Bennett Estate, Ysidora Guerra Palo Blanco Grant, A-258. IP 104 bbl. BOPD, XX-31 choke, 46.9°, GOR 739 cu. ft. per barrel, perfs. 4,960-72 ft. (Frio F-1 sand). TD 6,193 ft. (New pay in Mills Bennett field.)

Duval County: Killam & Hurd et al 4 S. Benavides Estate, El Mesquite Grant, O'Hern-Seacord Subd., Blk. 36. IP 85.69 BOPD, P-34 choke, 41.8°, GOR 75 cu. ft. per barrel, perf. 3,189-93 ft. (Yegua "B" sand). TD 3,258 ft. (New pay in Thanksgiving field.)

Starr County: N. B. Hunt and Parker Drilling Co. 1 Lehman, GCS&RGR Sur., Sec. 286. IP 3,200 M.c.f. daily (absolute open-flow potential), 10 BC per M.M.c.f., perf. 5,406½-14½ ft. TD 7,010 ft. (New pay in East La Copita area.)

PENNSYLVANIA

Indiana County: Manufacturers Light & Heat Co. 5-4430 R & P Coal Co., Armstrong Township. IP 108 M.c.f. daily after second fracturing. TD 7,777 ft., Tully 6,890 ft., Onondaga 7,558 ft., chert 7,585 ft., gas.

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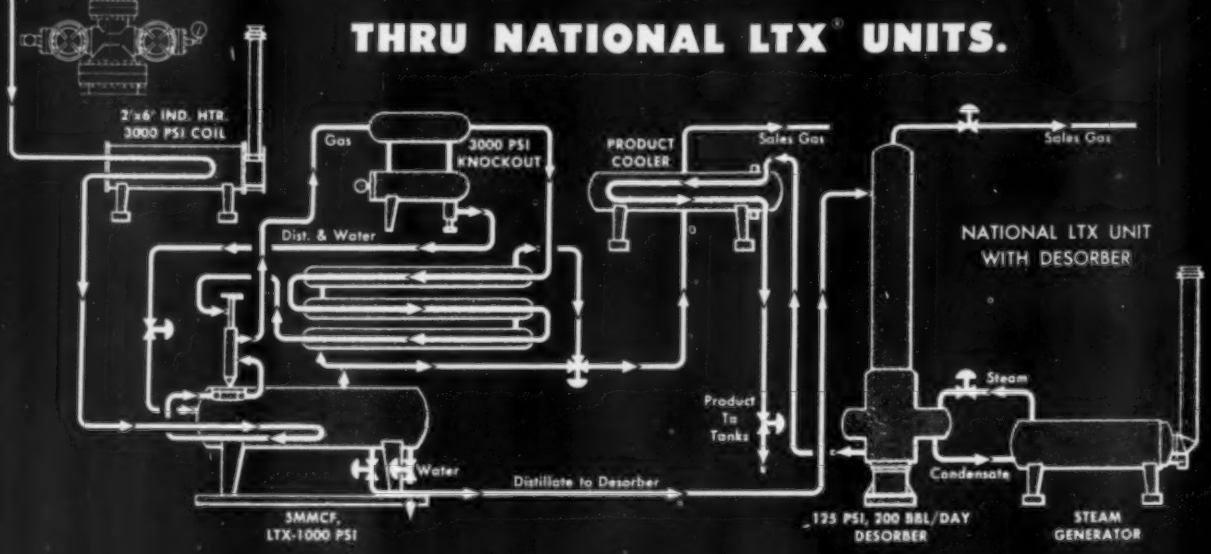

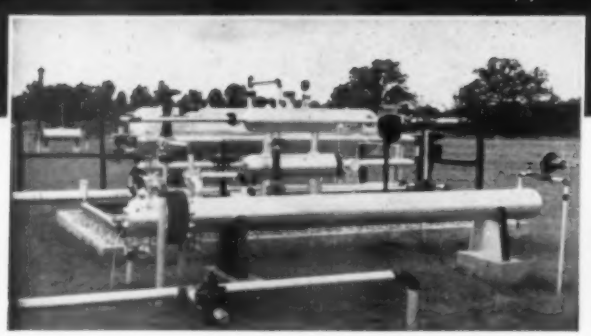

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